THE INCREDIBLE PLANET

John W. Campbell, Jr.

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The Mightiest Machine
The Atomic Story
Who Goes There?

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by

JOHN W. CAMPBELL, JR.

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INTRODUCTION

How Aarn Munro, Russ Spencer and Don Carlisle came to visit Magya, a planet of another solar system in another galaxy existing in another space, has been recorded elsewhere* in complete detail. However, for a clearer understanding of their further adventures, this introductory summary of their experiences seems desirable.

It was Aarn Munro's idea—the *Spencer Research Laboratory No. 6.* Aarn Munro was the director of the research department of the Spencer Rocket Co., and, incidentally, Russ Spencer's best friend. Russ Spencer, rocketship designer, and grandson of the famous Russel Spencer who founded the Rocket company a century before, in 1979, was to see realized the dream of his father and his grandfather before him—a ship that could make the interplanetary journey without fear of meteors or thought of power shortage.

Aarn Munro's father had helped Russel Spencer II, the present Russ Spencer's father; had taken part in a colonizing experiment, and, with twenty others, the Munros had been marooned on Jupiter—marooned because Jupiter's great gravity prevented the early rockets from leaving the planet after landing.

Aarn Munro was born there; he was twenty before he saw a ship land that could again leave the giant planet. Then the Jovian-born human, super-human in strength and speed from Jupiter's harsh training ground, had studied at terrestrial universities.

His extraordinary brilliance of intellect had soon made itself manifest; and after completing his training the tremendously massive scientist had gone to work for Spencer Rocket Co. It was due in large part to his genius that Spencer Rocket had forged ahead so rapidly to their position of leadership in their field.

After a long period of research in an effort to improve existing methods of interplanetary travel, Munro, Spencer, and

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their close friend, Don Carlisle, head of the chemical-research department of Spencer Rocket, embarked on Aarn's latest ship-laboratory, the *No. 6*. Aarn's three greatest inventions were to receive their first tests—the antigravitor, the transpon beam, and the momentum-wave drive. The antigravitor made possible their "aggie" coils, storing the tremendous power their projected, conducting transpon beams stole from the mightiest machine that ever existed—the Sun, and the momentum wave made possible their drive.

Following the wave theory of the atom, Aarn had learned how to produce in actuality the waves the theory had predicted as being momentum waves—waves created artificially in space which actually *were* momentum. Out in space they tested their new ship—with their coils fully charged—and for the first time in the history of space travel they exceeded twenty miles a second, multiplying this old record by two thousand. At forty thousand miles a second—

At forty thousand miles a second their ship, officially the *No. 6*, familiarly the *Sunbeam*, was protected against damage by three layers of force—the magnetic atmosphere, a layer of magnetic field that would stop any conductor moving toward the ship; the antigravity field, which tended to repel any body not already weightless; and the momentum-wave apparatus, which likewise would hurl away anything that would tend to change the momentum of the ship.

At forty thousand miles a second the *Sunbeam* had the momentum of a major planet—concentrated. And at forty thousand miles a second she struck a planetoid. The magnetic atmosphere blasted the hundred-thousand-ton mass of metal to gas—but it still had a hundred-thousand-ton mass. The anti-gravitor repelled it, and called on the great aggie-coil storage bank for support; the momentum waves lashed at it, and called on the stored power of a sun for aid—

The fabric of space tore open under that terrible stress, and they were hurled out of four-dimensional space into the fifth dimensional interspace.

They awoke to find themselves in another four-dimensional space, a space of supergiant stars, near a sun of tremendous size. One hundred million times as brilliant as their own Sun, Anrel shone fiercely hot on them, at a distance of 1,000,000,000,000 miles.

They met the Tefflans and the Magyans, the warring races of the solar system they had entered, and they joined the latter.

The Magyans, they discovered, were human in every way, so completely human as to seem impossible, until they learned that theirs was not the first spaceship to be thrown through the spaces. On the continent of Mu, the Magyans had developed on Earth, warring with a strange race of horned beings—seemingly half human, half goat—the ancient Teff-hellani, who lived in the vast caverns under Mu. In a final effort to destroy them, the Emperor Tsoo-Ahs of Mu first established strong colonies all over Earth, built space ships equipped with powers capable of opening the caverns to the sea—and unleashed his forces. Water rushed in, and Mu sank forever.

But a single space ship of the Teff-hellani escaped, and destroyed all but one of the Magyan ships. The two enemy survivors, in a vicious running space battle, collided simultaneously with a planetoid and were thrown through into this strange space. Each ship, its passengers thinking themselves the sole survivors, landed on one of the eighty-seven planets circling about Anrel, the nucleus of what was to become a world population. On Magya, after a brief struggle the people reverted to barbarism. Ages passed—and a new civilization developed. Space was reconquered; and the Teff-hellani were again encountered, with knowledge and a science approximating their own. And for both races, legends which had never died became reality, and the war of instinctive hatred continued.

There followed a prolonged and devastating series of space battles which ended with the near destruction of Magya and the complete obliteration of Teff-El and all its inhabitants. In this interplanetary warfare, the *Sunbeam* played a decisive part.

At last, with order returning to Magya, Aarn Munro, Russ Spencer and Don Carlisle prepared to return to their own space. They bade farewell to Anto Rayl in the airlock of the *Sunbeam*.

"The apparatus is installed, Anto Rayl," Aarn said, "the problem has been solved, and we have left apparatus with you. We must go now. Our home is on the other side of the wall, but we can both climb that wall now—so we of Earth will expect to see you of Magya soon. You will come?"

"Certainly we will come, Aarn Munro. We will want to see the Ancient World, where men such as those we have met are bred, and where the race was born. We will attempt to follow you through at the end of one thousand days.

"So—till then." Anto Rayl waved, turned, and dived across space to the entrance port of a great gleaming metal wall, the wall of a mighty battleship. And the airlock closed behind him.

BOOK ONE

THE INCREDIBLE PLANET

CHAPTER ONE

"WE READY?" ASKED AARN MUNRO looking at Carlisle and then at Spencer. The engineer nodded, half eagerly, half regretfully. The three turned toward the great metal bulk of the Magyan Battleship *Tharoon Yal*. A tiny figure in a microscopic port in the mighty wall waved a farewell.

"Here's hoping," exclaimed Aarn.

"Here's hopping—from one space to another!" Spencer grinned a trifle shakily.

The giant spaceship was suddenly expanding, growing tremendously—they must be rushing toward it. Instinctively their hands tightened on their grips, then relaxed, for the ship was suddenly impossibly huge. It seemed tenuous, ghostly—ghostly motionless figures became visible inside, then vanished in cloudy smoke and a darkening pall. Space was black; the wonderful gleaming suns that shone blazing in the strange space of Magya and her sun Anrel, the stars that had made that space a never-darkened curtain, were gone. Slowly, slowly, pinpoints of misty light began to materialize, stars, gigantic, cloudy things, growing then shrinking—and the change was complete.

"We're here!" Carlisle whispered. Munro turned the *Sunbeam* slowly around, revealing every angle of space. Only occasional stars were visible now. They had changed spaces.

"Where?" asked Aarn quizzically. "I don't see old Sol anywhere."

"Is this the right space?" Spencer demanded.

"Having eyes, you can see as much as I," suggested Aarn.

"Not having your knowledge, I can't," replied Spencer. "Engineering's mine. I built the apparatus you asked for, with the help of those Magyan engineers. It's your job to know where we are."

Aarn grinned goodnaturedly. The grin looked at home on his extremely broad face over his short thick body. "I'm worried too, so let's not get snappy. But I think this is the right space. Remember: Magya is in a four-dimensional space separated from our own space by a fifth-dimensional inter-space where we can't exist. We were first sent out of ours by the accident when we hit that asteroid, and our various forces started fighting the collision. That opened a path and kicked us out. Magya's space was the easiest to enter, and due to Magya's perfectly enormous sun and its gravitational attraction, we broke into their space at that point, as the Magyans had done before us.

"Now in getting back we've got to lift ourselves out of Magya's space, and bore ourselves into another space. That's harder to do—takes a lot of power. Also—there's no way to choose one space or another to fall into, except by our mathematics based on those ancient Magyan Data Plates and the analysis of our own space as we knew it from data gained while on Earth. But unless there is another space with *exactly* the same characteristics as those of our own space, we had to go to our own. The chances that there are two identical spaces is pretty remote. I think we hit the right space—but not at the right point. Remember, those calculations we were working from were nearly 30,000 years old to the Magyans. How many Earth-years?" Aarn shrugged. "Who knows? But I believe we're home—in the right space. And an indeterminable distance from Earth. We were lost in spaces. Now we're lost in space. The inter-space is so vast it contains thousands of spaces—but just the same even one rather unimportant minor space like ours is several hundreds of millions of light years in diameter. I *think* we are still in the same galaxy."

"Good Lord!" gasped Spencer. "We're as bad off as ever."

"How do we determine where we are?" asked Carlisle simultaneously.

"I've been thinking. Let's assume for the time that we're in the right galaxy. We're in *some* galaxy, because we can see so many stars. You'll notice there's a Milky Way effect only on one side. That means we're out toward the edge of the galaxy, since if we were deep in it the Milky Way would be a circle around us. We're probably somewhere near where the proper motion of Anrel during the last 30,000 years would take you from where the sun was thirty thousand years ago. I think we're still in the same galaxy. The problem is to find out where. That won't be hard if we're in the right galaxy, because there are still space-marks that will bring us near enough home so we can see old Sol and steer for him by direct astragation. Thanks to that inter-space speed escape, we can travel faster than light, so that isn't impossible to us."

"What are your space-marks?" asked Carlisle.

"Something far enough away so that moving about in the galaxy doesn't change them unrecognizably. Something far enough away so that lines drawn from them won't change so greatly as to make us mistake one for another, and yet near enough so that they *do* vary with the galaxy."

"The exterior galaxies," said Carlisle, comprehending.

"Exactly. But we can't do it ourselves."

"Huh? We can't? Then what good does it do us?"

"We'll have to ask somebody in the neighborhood," grinned Spencer. "We'll drop in and ask them: 'Do you know the way to the great nebula in Orion? Or Andromeda?' And the local boys will of course be polite and tell us."

"Something like that," replied Aarn more seriously. "We will have to find a race near here, or somewhere in this galaxy for that matter, and tell them what we need. If they have telescopes, and photography, they'll have pictures that we can compare with our plates here in the star catalogues and locate certain very outstanding nebulae. The Greater and Lesser Magellanic

clouds may help—though they are really part of this super-galaxy of ours, and very close. But they *are* distinctive."

"What're chances of finding a habitable planet?" asked Spencer.

"Oh, fine. There are nearly three hundred million stars in this part of the super-galaxy alone, and one in every hundred thousand or so has a system of planets, so they say. That means nearly three million planetary systems, and we want only one," grinned Aarn.

"Or," Spencer observed, "probabilities suggest approximately one star in one hundred thousand possesses a planetary system. Therefore, provided we investigate approximately one hundred thousand stellar systems, we'll find a planet."

"You might add," said Aarn cheerfully, "that maybe one in ten thousand of those planets might be habitable, and one in ten thousand of those will be inhabited."

"So things don't look very promising," Carlisle observed.

"Not as discouraging as they might seem. We might begin by ruling out stars that couldn't have planets that would be habitable. About one star in four is a multiple, binary, trinary or something. We'll rule those out. Then I'm ruling out giant reds, because I believe they're too young. I think it might be a good idea to just look at more or less ordinary main-sequence stars. Class G, for instance."

Bob Canning, the electronics engineer from Spencer's laboratories on Earth, who had accompanied them on their trip, appeared cautiously in the doorway.

"Did we get home all right, Dr. Munro? I didn't recognize the stars."

"I hoped you had, Bob. I didn't. I think we're about ten thousand light years from home," replied Aarn. "But we're getting ready to move. Just keep an eye on the power board, and we'll head for a near-by star and see what is to be seen."

CHAPTER TWO

"WHAT'S THAT?" ASKED CARLISLE dubiously. Aarn, Spencer and Bob Canning were working hard at something they had set up in the already-crowded power room.

"I hope it's a sort of twenty-mile diameter lens," replied Aarn. "Not exactly a telescope—"

"I didn't think so," Carlisle commented. It resembled one of the power boards. Four small anti-gravity field storage coils, miniature replicas of the giant "aggie" coils used in storing the power of the ship, squatted at the base of the board. A regular "transpon" beam set-up with appropriate meters completed the lay-out.

"It was designed as a modification of the regular transpon beam," explained Spencer. "Aarn worked it out on the math machines while you were sleeping. The regular transpon beam picks up power from any electric field. We've been using it mainly to tap power from the electric field of a sun, of course, but it will tap *any* electric field. Aarn modified it to tap the electro-magnetic field of light radiation. This is a sort of radio-funnel. It will reach out as a very rapidly spreading cone, and trap any electro-magnetic radiation, rectify it, and bring in half the field energy. Aarn says he's going to learn a lot with it."

"Hmmm— pick up light like a radio wave. Why?"

Aarn answered him. "I can pretty well focus it, and thereby pick up light from one star and its attendant star field. That way I can examine a star's radiation when it's a lightyear or more distant, and do it accurately. There are certain—modifications in the light that may be telling."

"I suppose," grumbled Carlisle, "it would be 'telling' if you explained what those modifications will be?"

"It would," agreed Aarn, and fell to work again. "However, having visited fifteen stars fruitlessly in the past five days, I'm getting sick of chasing my tail all over space. This may help."

Six hours later they had finished the set-up, and Aarn started it. They were hanging in space, the artificial gravity of the ship alone supplying weight. The power room was crowded by the great humped backs of the anti-gravity coils which would iron out the space-curvature that was gravity when they maneuvered near a planet—the momentum-wave apparatus that set up the incredible oscillations in sub-space that generated momentum in them, and reacted on all space—the overflow of aggie coils clamped wherever the Magyan's had found space while they helped outfit the *Sunbeam* for power in battle—all hiding the mathematics machines that somehow found lodgement here. The new power board was set in the last remaining free space.

Swiftly Aarn adjusted his circuits, then threw a single relay. A network of glowing transpon beams exploded into being, and a deep reverberation thundered in the power room as the great main transpon apparatus, modified by the new device, took up its work. Out into space a great invisible flaring cone spread like a widening ripple. The meters on the new board began to register readings, some instantly, others at a gradually increasing pace. At length the limiting range of the cone was reached, and the collecting field maintained a steady value.

Aarn read off the figures rapidly, Spencer taking them down. Five minutes later the *Sunbeam* was in the strange ghostly gloom of its high-speed motion. Half way between the inter-space fifth dimension where fourth-dimensional distance meant nothing, half way in normal space that they might keep in touch with their surroundings, the *Sunbeam* raced toward the star they were studying. They stopped after a few minutes, and again Aarn took readings.

In this way, in an hour, he had all the data he wanted concerning this particular star. In half an hour he had calculated the

results, and definitely knew that there were no planets circling that sun.

The next star was thrown out by the first reading. It was a binary. Another and another followed.

Two days—and Aarn shouted with sudden triumph. The star they were investigating had planets—or at least one planet! The incredible had happened. They had found a planet in mere days of search and trial!

"It looks," said Spencer as they raced across space toward the distant sun, "as though your pessimism was unwarranted."

"True," admitted Aarn, "but I wasn't raising any false hopes."

"What kind of a star is it?" asked Carlisle.

"Frankly, I don't know. It seemed disturbed, rather than variable, somewhat irregular, but that may simply mean that it has a very close planetary satellite that glows red-hot in the radiation of the primary, and acts as a secondary radiator. It seems to be a type F O, and not on the main sequence. Probably comparable to Capella."

Crossing in each second a gulf that took light months to cover, the *Sunbeam* sped on toward the strange sun. Despite their incalculable speed, the flight took more than two days. On the second day they watched the ghostly image of the sun waxing from a distorted pinpoint to a blurred disc, and they slowed to a safer pace at the outer edge of its gravitational field of influence, dropping more and more into normal space.

They stopped, and from a distance observed the planetary system more carefully. They saw the strange little planet that was the secondary radiator of this new sun, a body scarcely 2000 miles in diameter, circling in an orbit less than ten million miles from the blazing blue-white sun they were to know as Tarns. Heated by the terrific flood of energy, it acted as a varying secondary radiator that had produced the effects that Aarn had observed.

There were eleven planets in all. Nine of them revolved in fairly normal orbits. The sixth, a giant nearly a quarter of a million miles in diameter, caught their attention immediately.

"It's a monster," said Aarn thoughtfully, checking the gravitational field analysers. "And what an orbit! Gravitational field at surface: 2.1. But it has a gravitational control that extends nearly a billion miles. Eight satellites—and that one is larger than Uranus! I'll bet that was a real planet, captured by this big fellow. And look at that outermost satellite there! Five thousand miles in diameter—bigger than Mars—and it isn't in an orbit about that big planet at all! It's on a free orbit! Something has happened here—and I'll bet I know what! A thing impossibly rare—"

Aarn's comments trailed into silence as he set new controls on his strange probes of gravitational fields, and momentum-wave analysers, investigating that mis-oriented planet, now revolving about the giant world. Rapidly he read the instruments.

"It's 134° out of the plane of the other planets! A wanderer that's been captured. Within the last century, too, I'll be bound. Look—it's 57,000 miles in diameter; its orbit is an extreme elipse, retreating to nearly 10,000,000,000 miles at its greatest distance out, and coming within 50,000,000 on the inward trip! That planet was free, and wandered into this system by accident. That giant there dragged at it so hard with his heavy gravitational field that it was caught! It yanked the whole system of moons way out of position, even pulling that giant planet out of its orbit, and knocking loose its outermost satellite—but the planet stopped its wandering! It probably came in with a parabolic orbit, and the attraction was great enough to slow it to an eliptical orbit. That's unique in the galaxy, I'm willing to bet.

"We're heading for that planet!"

The *Sunbeam* darted forward, the ghostly image of the strange planet growing rapidly. At a distance of twenty million miles Aarn halted, and investigated it by telescope. The image was thrown on the screen by the televisor device, clear and sharp.

"No hope of life there," Aarn commented. "It hasn't thawed out yet—or—no it hasn't. I thought it might be coming in on another trip from space on that huge orbit. See the ice-caps—

and those seas! They're ice too, I'd swear. The whole polar region halfway to the equator is frozen. A weird slant to the axis, too. Nearly seventy degrees. Let's land—shall we?"

"Naturally," replied Spencer. "But you'll have to do all the investigating." He pointed to the gravitometer. The surface gravity of the planet was 2.6.

Aarn grinned. "So I will. Weaklings—weaklings, these Terrestrians. And to think my own father and mother must have been such people!" Jovian-born Aarn Munro held out an arm, an arm thicker and bulkier than Spencer's muscular thigh. The arm was attached to a shoulder that was so humped and layered with great muscles that the short powerful neck was almost buried in it, his head seeming to peep out of a shell, like some strange human tortoise. He clenched his fist and flexed his arm, watching the smooth flow of great lumps and cords of muscle. "I'm getting soft—living on a light planet, like Earth or Magya."

The *Sunbeam* darted forward again, under her momentum drive. Waves even Aarn Munro scarcely understood, waves in the sub-space, generated by the machines he had invented, imparted momentum to the ship by reaction on the structure of the universe, and drove the *Sunbeam* forward at terrific speed. New transpon beams appeared automatically as the gravitational field of the planet began to affect the ship. They slowed at a hundred miles, and hung motionless. Automatically the gravitational field of the planet was neutralized, and the interior artificial gravity of the ship maintained at Earth-normal.

And then—Aarn caught a glimpse of the great mystery of Myrya. He clutched Spencer's arm in a grip that made the Terrestrian yell with pain. "Spence—Spence—ruins!"

They glistened under the blue-white sun, magnificent, majestic. Gleaming metal overlayed with a thin layer of ash. Great broad avenues, choked with the debris of slowly disintegrating ruins. Tremendous buildings, awesome, beautiful—with their towering crowns crushed and crumbling. A giant city that spread

for a mile up the side of a great mountain, and for three miles across the valley below.

"People!" gasped Carlisle.

"How—how old is that city?" asked Spencer slowly.

"Millions on millions of years old!" Aarn moved suddenly, and the ship shot precipitately down toward that ancient city.

Slowly they sank the last mile, and landed gently in the half-choked great square of the ancient city. About them loomed huge metal towers, their walls rising sheerly skyward, decorated with powerful, clear-chisled frescos. The streets were wide, paved with a thick layer of crumbling black stuff that moved away uneasily as the field of the *Sunbeam's* forces touched it. The ship came to rest nearly a foot deep in the impalpably fine dust.

Aarn stood up and looked out of the port before him. "How long, oh Lord, how long? It must have been here all the time this planet wandered cold and lifeless. Millions of years? Billions! What race lived here, fought and built this city, then died as the planet began its age-long wanderings?" He paused, frowning thoughtfully. "One thing I can't understand is the layer of dust. It's black and dirty looking. The pavement seems to be part of it. Now, what did that? There was evidently no weathering, so where did all the dust come from?"

Carlisle had been busy in a practical way. "The oxygen content is about 4%, the air pressure about 100 pounds per square inch."

"That's fine—just about right," nodded Aarn. "Any poisons?"

"No simple ones, and I doubt that there would be complex ones. I've got one of our few remaining mice in it, and he's still going strong. Nearly passed out at first, though."

"Umm-hmm. Pressure. That won't bother me—it's just about the same as Jupiter's atmosphere. I'm going out right now."

Rapidly Aarn prepared himself. He put on a dust mask, and carried a tiny thing he had developed only recently, a hand elevator, he called it. It was a miniature momentum drive apparatus with aggie coil storage of power. Gripped in one hand,

operated by thumb pressure, it would lift him about readily. He could not really fly on it, but he could move straight up.

"I'm going too," announced Spencer suddenly. "I can stand it for a while, I guess."

Aarn looked at him thoughtfully. "Pretty heavy labor."

"I can make it for half an hour, anyway."

In five minutes they were ready. Carlisle had decided to remain in the *Sunbeam*. He had tried Jupiter once, and once was enough. Cautiously they let the new atmosphere enter the lock, getting used to the pressure.

"Feels good," grinned Aarn as the pressure reached the half-way point. His normally deep voice sounded heavy and booming. There was a chill in the entering air, and the fresh, clean odor of new-growing plants. "Those green things we saw must have been new plants coming up," commented Aarn, inhaling deeply. "Smells good after a few days in the old tub."

But they were tense, and tensely Aarn stepped out. It was a two-foot jump to the apparent surface, and dubious as to the solidity of it, Aarn lowered himself on the hand-elevator. There was a queer wrenching sensation as they passed through the neutral zone, where the gravity of the planet was neutralized by the artificial gravity of the *Sunbeam*. Then they were down, sinking ankle-deep into the thick, drifted dust. Aarn stretched luxuriously, staring sympathetically at Spencer, who was struggling erect with gruelling labor. Minutes passed while the smaller man strove to adjust his Earth-trained muscles to a gravity that gave him a weight of approximately four hundred and fifty pounds.

At last they started toward the nearest building, Aarn moving lightly, and with complete ease. His feet seemed to adopt the swift, jerky motion of a trotting dog. Spencer found that with a little more effort his feet could be lifted free of the dust, and that a fast walk was easier than a sliding shuffle.

Rapidly they approached the nearest of the great buildings and peered within the great arch. It was cold in there, bitterly cold, and a stream of freezing air drifted slowly out. It con-

densed in the sunlight into a fleecy white mist. Aarn glanced upward. The air was clear and cloudless, the great sun glaring bright orange far above, the sky a deep, deep blue with a tinge of green. There was no hint of dust or mist in the air, the only cloudiness visible pouring from the surrounding buildings.

"They haven't thawed out yet!" said Aarn in a low voice. "This world can't have been here for more than a few years!"

"Years—would it take years to thaw these out?"

"More. Years would have been needed to warm up the tremendous masses of air that must have lain frozen solid. Then the ultra-frozen rocks—and in all probability these buildings had some sort of insulation. Those giant buildings—well, sky-scraper type buildings of metal represent a high civilization—and metal buildings just *have* to have heat insulation."

"I agree with everything but your interpretation of these sky-scrapers. They aren't more than fifty stories tall, and while that's a goodly building, New York has lots bigger."

"Remember, this place has lots greater gravity. Half the height here means more than twice the height on Earth. The buildings weigh more."

Aarn passed through the tremendous arch. A great hall, lofty and dim, greeted him. Huge columns, fluted and rounded gracefully, stretched up into the semi-gloom to form an arched and groined ceiling, barely visible in the light that entered through a few broken windows. The hall was paved with mosaics formed of tiny bits of colored tile, at one time ground to a polished surface. Now they were worn into deep channels where countless thousands of passing feet had scored them through countless centuries.

"Spence—this was ages old when they deserted it."

Aarn examined the mosaic floor. It was a map, a gigantic map of a continent, probably the one on which they had landed. It had been wonderfully fashioned, and he saw now that not mere chips of tile had been used, but rather tiny sticks of it, some eight inches in length, laid side by side to form a pattern with the ends, which though worn now inches deep, was still

perfect. The map was unchanged from the day, untold ages gone, when it had been laid down. A dozen cities were marked out clearly in the area they could see from the doorway. But—one of the cities, situated evidently in the heart of a mountain range, was not done in the tile! It was painted on the surface of the mosaic, and a brilliant crimson circle had been drawn around it. Some symbols, letters, had been scrawled beneath the ring, and an arrow pointed to it.

"Their last retreat?" asked Spencer softly.

"No doubt. We'll have to go there. I'm afraid of investigating here too much. I don't know what destroyed these buildings. There's some evidence of earth-quake—or better, planet-quake—but that doesn't account for the dust and the crumbled tops of the buildings. Did you notice, the lower hundred feet or so was not damaged to any great extent, while the upper part was badly eaten, as though by some virulent acid? It must have been something that acted while the planet wandered free in space, the frozen atmosphere protecting the lower part. But what? Couldn't have been meteors—"

"Cosmic rays?"

"Well-l-l-l—maybe. But I don't think so. Cosmic rays act on about one atom per cubic centimeter per second. How many seconds would it take before the material would have been affected appreciably? This planet would have to be older than the stars for that. I give up."

Spencer glanced toward the shadowy ceiling. "Let's get out of here. This dead city gets on my nerves, and I'm afraid something will fall."

"As you say. Anyway, I want to see that city." Aarn pointed toward the red-rimmed city, on the map. "I think it may be highly interesting. The fact that it was painted on and not set in, indicates that it was new and placed there hurriedly. They must have retreated to it, aware of the advancing peril. Why they indicated it thus I naturally don't know. Maybe it was left as a guide to the race that might find them in some future day. They may have left records easy to interpret. Shall we go?"

Ten minutes later they were decompressing in the *Sunbeam,* and an hour later they took off, with the aid of Aarn's carefully drawn map, for that other city. They cruised slowly, for they weren't sure of exact directions or exact distances. They located the great mountain range, and the city.

And Aarn sat frozen at his controls for thirty long seconds.

Men, busy, crowding men, were working down there. Machines were moving materials. The city was alive!

"Lord!" he whispered at last. "They *lived!*"

"They—they couldn't! They must be from one of these other planets."

The *Sunbeam* dropped. There was a sudden scurrying down below. Half a dozen air machines, jet propelled, and with short stubby wings, swooped up suddenly, gracefully. They came nearer the *Sunbeam,* to be deflected sharply by the magnetic barrier surrounding the ship. Then they turned, and keeping pace with the ship, finally landed on a broad open space at the edge of the city.

The city itself was built in a great cleft in a mountain range, a valley nearly a mile deep. And at either end, a titanic structure of metal and concrete rose nearly half a mile, a tremendous dam closing it in a great hollow three miles long and one wide, by half a mile deep. The landing field was near the base of one of those incredibly huge dams.

"How's that for engineering, Spence?" asked Aarn in awe. "Every thousand pounds makes a ton and better here."

"Terrific. Are we going to land?"

"I think they're friendly." The *Sunbeam* dropped abruptly and lightly, landing on the field beside one of the two ships. For the first time the men saw a Myryan. He was short, and muscled as powerfully as Aarn, his face broad and pleasant, his skin a deep golden bronze, smooth and hairless. A mane of gold-red stood short and silky on his head. His ears were cupped, and mobile, but otherwise he was surprisingly human. His entire bodily structure was heavier, but in every way he was human—and handsome. There was an expression of curious surprise and

interest on his face now, but somehow deep graven lines of intelligence were there, with a permanent set of deep, triumphant peace. Above all, he looked happy.

"Welcome, who come from the nothing," said something very distinctly in Aarn's consciousness as the man outside caught his eye. "Will you come out and join us?"

"What?" Aarn was startled. "Spence—it's telepathy!"

In an instant Aarn was up, racing for the lock. He was in the lock, with the pressure half way up to that of the exterior before Spencer got there, and he had to wait till Aarn went out.

Aarn leaped down, and landed lightly beside the ship. He strode swiftly toward the stranger, his hand outstretched in greeting, a smile of astounded joy on his face. "You lived!" he exclaimed.

The other smiled broadly, somehow giving the impression that he was waiting for something. Crowds of other men were drifting forward now, nearly two hundred of them; and then a car came up swiftly, low, broad and massive, and stopped nearby. Two men got out. One wore a simple suit of pure white, as white as the mane of silky hair that covered his head and neck; the other, in golden cloth, was dressed as was the man Aarn had first seen. The man in white came forward. Somehow he looked young, despite his white hair.

"Welcome, who come from the nothing," he greeted as he approached. The first man had fallen back, still smiling. "Do you come from one of the planets of this system? We have seen no evidence of inhabitants with our telescopes."

"We come from—somewhere. We are lost in interstellar space. But you—you lived! It's—impossible!"

"Interstellar space—the space between suns? Then you come from a far distant sun—but that cannot be."

"It can be—but you—you lived! How in the name of the Eternal Mind was it done?"

"We lived. Some of us," replied the Myryan slowly. Aarn caught a mental picture of long rows of white-draped figures that had not lived. Rows on rows, in a subterranean chamber,

carved in solid rock, lit by a few glowing tubes. "You have done what we sought vainly. Had we done it, all would have lived. Lived—and died—ago." Aarn could not understand his idea of time. Only that it was vast beyond belief. Something so immense that it stunned this man who had lived through it. "You have traveled faster than light?"

"Yes, in a sense." Aarn was beginning to think again, his mind coming to order from its chaos of thoughts. "As a world is round like a ball, so is all space rounded. The ball of space is floating in a greater interspace. When we travel, we move into the interspace, and back to four dimensional space at a different point. It is not motion. It is not velocity. And it is not travel faster than light. It is merely translation. We disappear, cease to exist in this space, then come again to existence elsewhere."

"Your thoughts are meaningless to me. But it is not important now. We are safe again. We have a sun. We will not soon be torn away."

Spence called from the *Sunbeam,* "Aarn—give me a hand. I want to get into that discussion." The Myryans looked curiously at the slim creature standing in the doorway, three feet above the level of the ground, and afraid to jump. Aarn went to him, and quickly lifted him down. Together they returned.

"We come from different worlds of the same solar system," Aarn explained. "This man comes from the mother world, and I from the larger, heavier colony world. My planet is as large as yours, his far smaller."

"You are Aarn?" asked the white-haired one. "I am Karshan, of Myrya."

"I am Aarn, of Jupiter. This is Spencer, of Earth." Aarn's thoughts turned continually to the mystery uppermost in his mind. "But—how could you live?"

"We did not. We died, and came to life again."

"How long ago? What happened?"

"Your mind cannot translate my terms, not those of time. But you can understand this. When we circled Shaln, we were

far out at the edge of the galaxy. In our skies at night blazed a great, broad ribbon of light, bright as a sun, lighting our world day and night at certain seasons, but with a cold light. We have pictures we will show you, and perhaps you can understand. I will show you the messages we left when we awoke each time. You must train yourself, though, to understand them."

"How long have you been here?" asked Spencer. "Have you taken any photographs?"

"We have been circling this sun for three thousand days." That meant about six years. "We have taken photographs, of course, but have learned little. Why do you ask?"

"We are lost. Only with photographs taken during the course of years can we find our own sun," explained Aarn. "I am afraid you cannot help."

"I fear we cannot. We have had little time to study. There has been so much to do. Our lot is happy, but all is not perfect even yet. Our orbit is exceedingly irregular, and we must make preparations for the long, long winter. Our world will be cold, very cold; it will require more than one hundred thousand revolutions of our planet to establish a circular orbit."

"There I can help *you*," Aarn said eagerly. "Let me see these incredibly ancient photographs, let me investigate your mechanisms and history—and in turn I'll show you how to direct this planet into a circular orbit of any size you like, and do it within five revolutions. I'll show you how to get heat enough to warm your whole planet even when it is farthest from the sun."

"You have the secret of the power of matter too?" Karshan asked eagerly.

"Yes and no," Aarn smiled. "We take advantage of a generator that already exists. The sun. We tap its limitless power. We have a beam which will conduct power of electric fields. It makes space conduct electric strains along a line, and we can tap them to any extent we choose. A star is a seething mass of electric strains, and we can get power enough to turn a hundred worlds from their orbits!"

"The power of the sun? Of Hope, of Tarns?" Karshan said it both telepathically and orally. "We have named our sun Hope. It was the light of hope for us. If we can tap its power, we are saved indeed. But how can you move anything so huge as our planet?"

"Our ship is driven by establishing a thing which is like an oscillation, but is not; it is radiated momentum. It throws momentum into the fabric of all space, and accelerates any body we wish. On so huge a body as this years would be required, but it could be turned. I will show your engineers. You have engineers." Aarn looked at the great dams.

"Those dams held the solution over us while we slept. They kept the rays of space from crumbling us as they crumbled other things. If you can show our engineers how it may be done, we shall do it. We have dreaded the long night. It would be unbroken night, for at a distance so great, even this hot sun would be only a star, and we would have frozen all we have gained. Our world would never again thaw out as it should. Even so, centuries will pass before our seas thaw. They have frozen to a depth of nearly five miles. And the world is cold to its core."

Half an hour later, Spencer reluctantly returned to the *Sunbeam,* unable longer to stand the heavy gravity. Aarn, with Karshan, returned to the city. The long day of Myrya was drawing to a close. Long tubes hidden under carvings of the buildings were glowing now with a yellowish light that illuminated the streets. Scattered lights began to appear in windows of the half-depopulated metropolis.

"I shall lead you to our central Dormitory," said Karshan as they turned away from the main square of the city. "You will find a group of men there who are anxious to meet you. Physicists, chemists, engineers. They will want to discuss our problems with you."

"What is your source of power?" asked Aarn suddenly.

"We, too, tap the power of the sun—indirectly, however.

We have apparatus—safely away from the city—which sucks in the radiant energy and concentrates it on a series of photo-cells which convert it to electric power. Ours is the only city left with a usable power plant, of course; we have poor power now. We can run none of our machines at night, except in great emergency, and our light is limited, even with our very small population."

"What is your population?" asked Aarn.

"About two thousand men, and some twenty-two hundred women. The women survived the Sleep better, for some reason. There are too few men to run our city efficiently. There are, fortunately, some representatives of all the sciences.

"So many of us died. There were seven hundred and eighty-nine thousand, five hundred who entered the sleep. No more could be accommodated. Few more wanted to. Those others left messages for us when they died. Records of what happened. We found them, after our first awakening, and put them in a safe place here in Tarnsor. We will show you those, too. The dying buried the dead. We who lived had more than seven hundred and eighty thousand of our companions to bury."

Aarn grimaced. "What a task!"

Karshan smiled slightly. "We did not mind too greatly. It is hard to sorrow even for loved ones when a wonderful, incredible fact has been realized. We again saw a sun. Many of those who re-awoke did not, of course, realize what we had gone through. Some did. I did. I had been awakened three times before this last, to disappointment. You can imagine with what joy I started the machines which would awake all my people. Even when we realized that many, nearly all, in fact, would never wake, we still exulted in the knowledge that Man had conquered Space and Time. So we simply buried them in the vaults where they had slept so long. They will never know."

They stopped before a long, low building, nearly every room of which showed a light. There were four doors, through which people were constantly passing.

"These are the quarters of the unmarried people," Karshan explained. "Most of our people are unmarried—now. The young

survived in greater number, and when nearly all died, all but three couples were broken up. We are starting life anew, all of us. There have been many marriages since the Awakening, and our population is again increasing." A smile lit his broad face.

Through a great central lobby, where chairs and lounges made groups of men comfortable, they walked, all heads turning toward them. They entered an elevator, and were carried rapidly to the seventh floor. A short walk down a wide corridor brought them to a large lecture hall, in which half a hundred men waited expectantly. Their buzz of oral conversation ceased as all eyes were directed on Aarn.

All save two of these men were clad in the golden garments of the citizens. These two, middle-aged, were dressed like Karshan in gleaming white.

Aarn followed the three men in white to the platform at the end of the room. Karshan went directly to the speakers' table, and stood silent a moment. Then his telepathic communication came, weakened because it was not directed:

"Gentlemen: You know the extraordinary thing that has happened. The Eternal Mind has tested us, it would seem, and has found us good; certainly He has smiled on us. Aarn, this man from a world of another sun, has brought to us at this critical moment a solution to our great remaining problem. Our conquest of an inexorable nature would seem complete. Aarn offers us a means of tapping the Tarns directly. A beam of conducting force which I as an astro-physicist can barely understand. It will, however, carry power from the sun down a conducting beam to us. That will solve the problem of cold for us this winter. But further, he has solved the secret of the Laws of Motion. Unlike Rashan, he needs no fulcrum to move our world. He can change our planet's new orbit to a circular one, or show you how. The engineers must learn.

"It will be a great task—but to us now—what is such a problem?" A sighing chuckle ran through the audience. "At any

rate," Karshan continued, "Myrya will be made completely habitable.

"But Aarn himself is lost in space. He asks us to help him find the space marks that may guide him home. His problem is to locate in a short time the exterior galaxies known to him. I do not know how this may be done. I ask for suggestions on this, and that all such suggestions be made mentally."

A period of tense quiet followed, a period of thought. Finally one of the men arose. "I can see only one hope—photographic mapping of the entire sky. That is a task we cannot possibly accomplish in less than two of Myrya's new years. One thousand days at least would be needed to construct a suitable telescope, since none is now in existence. At least two years, preferably three, would be needed to map the entire heavens. I am afraid there are mechanical difficulties we cannot overcome. Further, if the planet's orbit is to be changed soon—and it must be—a period of at least ten orbital revolutions should be allowed for steadying and damping of oscillations, and for calculations of perturbations caused by other planets of this system."

"I realized that," said Aarn, standing up. "I know it is impossible for you to help us. We will start on a search for another race which has been more fortunate than you. But before we go, I shall give you some hints of things that will speed your work of mapping this system. First, of course, will be space ships, capable of making the trip from world to world. Second will be instruments by which you can obtain direct and exact readings on the gravitational field strengths of each planet, and momentumometers to read its motion. Already, I find, I have more accurate data on the present orbit of your planet than you have, due to the use of these instruments.

"I shall give you what we have. In return, I want to learn the story of your incredible survival of the cold of space, poorly equipped as you were."

Six hours later a commission of engineers and physicists had been appointed to study, with Aarn Munro and Russel Spencer, the apparatus they would need.

CHAPTER THREE

DOWN, DOWN, DOWN, DEEP INTO the solid, granitic rock Aarn went with Karshan. Dim-glowing tubes lit the shaft as the boxlike elevator ran down slowly on its own cogwheels. Under the heavy gravity of this world, no cable could have supported the elevator as it dropped nearly half a mile into Myrya. Colder and colder it became as the tiny box sank.

"We have heaters," Karshan explained with a shrug, "but what does that mean? They have been running at full force for nearly six thousand days, and even now if we were to turn them off, the air would condense to liquid, and would solidify in a few days. In twenty days the shaft would be half full of a slush of frozen air."

The terrible, biting chill, penetrating through the heavy, insulated suits they wore, grew more intense till at the half-way point it reached a maximum, and remained constant. Streams of slow-running slush could be seen on the bare rock walls as the car sank with a slight rumbling of its geared wheels in the tracks sunk in the wall.

"Aren't those tracks brittle with cold?" Aarn asked.

"They aren't cold. They're the heaters," Karshan explained. "We run a heavy current through them. The car feeds on that anyway, and it is the only way to prevent their becoming as brittle as glass."

"I expected it to grow warmer with depth as most planets do," Aarn commented.

"This one did when we first slept. It is too old now."

"Too old!" Aarn fell silent. The Earth was some two billion years old, and heated on the surface by an accumulation of radio-active rocks. That radio-activity would continue for additional billions of years. Tens of billions. This planet was—*too old!*

At last the car ground to a stop. A hewn tunnel in the rock led off to the right in a gentle curve, illuminated by long orange-red bars of light. Aarn felt the warmth pouring from them and realized that lighting had been combined with heating. "These are always going?"

"Always," Karshan nodded. The passage curved again, and entered a larger chamber, from whence three passages led. Karshan paused, and finally took the one on the left. "I will take you first to one of the Refuges. There you can gain some idea of the beds in which we lay. This is the room where the scientists slept. There were ten thousand in here."

They entered the room, a tremendous chamber filled with great stone tanks. On the bottom of each was a carved impression of a man's body. "We lay there. That was mine," said Karshan. It was near the entrance, one of a group of seven close together. There was a symbol carved in the floor near these tanks. The Myryan for one. "I was number three of group one."

Silently Karshan led the way to one corner of the gigantic room. In an alcove was a complete power station set-up. Huge oscillator tubes were visible.

"In each of these tubes," Karshan explained, "a coil of heavy silver tubing is wound. This apparatus can send a powerful high-frequency current through it. In the base of each of those tubes is a rugged automatic apparatus designed to boil off the solid and liquid air that would inevitably fill it. We slept in special suits that would protect us from the cold once we were warm and awake again. They contained tanks of air that would supply us for two days. If we did not regain consciousness in that time—

"You see, we knew for nearly ten generations what was coming. Our scientists struggled to learn either the secret of

flight through space at speed greater than that of light, or the secret of the energy of matter. Some worked on means of living through the cold.

"Marlan found the secret of the Sleep three generations before the Breaking. We pinned our faith on it. We built this city, always with the thought that so great an undertaking took time, and that if the other secrets were discovered, our refuge here could be abandoned. These chambers are far below the solid rock of the city. The dams—they were to protect our machines. We had a vast bank of photo-cells up there.

"But I must tell you in order. The astronomers first saw and recognized the danger. Tharl, a great red sun, was moving toward us. We did not know it till the spectroscope was invented. Then it was years later that we learned it was not only moving toward us, but *at* us. Our sun Shaln was a yellow normal star. We knew what would happen. Our planet revolved well out from its sun, and Tharl would pass close to us.

"It was a terrible time. Tharl gleamed like a red eye, and grew imperceptibly during our lives. But we could tell in the end that it was growing. Our scientists did all in their power. Men were born, lived, had children, and died, knowing the doom of our world. Many men turned to physics and chemistry then.

"Tharl was so close in my youth, I could study it through a small telescope. It had no planets. Already it was beginning to affect our orbit, for it was gigantic, and its gravitational arms reached out hundreds of billions of miles. Nearly two light years, in fact. I took up astro-physics, and when I was still a young man the exact calculations were finally made. Before, it had not been definitely known just what would happen. Some thought our planets would be thrown into Shaln. Some, that we would be captured by Tharl. Some said we would be hurled into it, others that our own sun would explode and deluge us with fire.

"We knew finally. Tharl would pass at a distance of hundreds of billions of miles. Myrya would be torn free of Shaln in an ever-widening orbit as Tharl approached, but so slowly that only as Tharl retreated would Myrya be free of Shaln. Then

the retreating Tharl would leave Myrya free in space. All but the two innermost planets would be torn from Shaln. The three outer planets of the system would be attached to Tharl in enormous, enormously eccentric orbits. We, and two other planets would simply be torn free of both. Our system of ten moons would stay with us, and would scarcely be perturbed.

"The process had already begun when I started my observatory work. I could watch it myself, as the planets began to elongate their orbits toward Tharl, so gradually it was barely perceptible.

"Tarnsor—the Refuge—was completed, and the engineers began the greater work beneath the city and above. The dams were built. The pits were dug. There were no quakes to fear, for the effects were so gentle, and so wide-spread in time that no shocks would result. The physicists and astro-physicists had calculated, and calculated well. We knew that our greatest dangers would be from two sources—cosmic rays and meteors. Our re-awakening depended on the machines which we must leave at the surface. But if a meteor struck them—or the slow action of cosmic rays disintegrated them—therefore the dams.

"We ourselves were to sleep in these deep chambers. Marlan had found the system which would induce suspended animation. No better preserver of life could be found than the absolute cold of space. Men experimented with themselves for fifty years, and were awakened in perfect health. That meant little, of course, save that the drug was good.

"Seventy-nine chambers were prepared, each capable of housing ten thousand men. This one was the room of the scientists. You see our hope. As Myrya wandered through illimitable space and infinite time, somewhere, somehow, she would blunder into the gravitational field of a star, circle near, and be warmed once more. Eventually it would be captured. We had calculated that one star in four was a multiple, and one in a thousand had planets."

"One in a *thousand!* We calculated one in a hundred thousand."

"One in a thousand is right. We studied the question rather —carefully." Karshan paused momentarily. "We hoped to be captured by some such star. If no heat reached us, if the cosmic rays did not destroy us—we might. Many would not accept the system. It was better so, since we could care for but a small portion of the people.

"I was mature when Shaln slipped back and back into space, and Tharl raced on ahead. The two stars began to give less and less heat. The people all over Myrya began to feel the first icy clutch of the eternal winter. They had dug deep caverns, and in them set up heating apparatus. They had huge energy-concentrators, using the power-system of all Myrya to heat and light their caverns. You see, they were certain the glowing gas of the galaxy would shine wherever the planet wandered. They depended on it. Their calculations showed that this energy would always be available. But we knew their calculations were wrong.

"Come. I will show you the pictures."

Rapidly Karshan led the way to the Records Vault, a huge chamber carved in the rock, but lined with twenty feet of solid lead. Aarn walked through a narrow, crooked corridor in the massive block of metal. Within was a room with dozens of the heater-rods glowing, and an equal number in darkness. Here the temperature was quite normal and bearable.

"It is heavily insulated," explained Karshan. "Now we keep it at a uniform temperature."

He went to one of the great cabinets and from a compartment took out a reel of film in a metal can, not unlike an ordinary motion picture film. A projector stood at one side of the room, and a sheet of silvery glowing substance covered the opposite wall.

"This reel has been opened recently, to show again to our people. The others are sealed in helium gas at twice atmospheric pressure."

Quickly he inserted the reel, and touched something. The orange glow of the heating and lighting bars died rapidly to black, and Aarn realized that the previously dark bars were now

warm. Then suddenly a picture appeared on the screen. Across a wide horizon made jagged by trees and waving plants appeared a starry sky—and a giant, sprawling cloud of glowing, misty light. Low on the horizon was a red gleaming disc. "Tharl," said Karshan briefly. "And the galaxy."

Aarn felt a sudden chill course down his back. The cold feet of scampering lizards. That was the sky this man beside him had seen. *How old was this man? Old as the galaxy itself?* Aarn looked about him with a queer sick feeling. These walls of lead had been built by hands of men who lived before the stars were born! This world was older than the galaxy itself! It was wrong, *wrong,* WRONG!

Aarn looked again. It was a different view of the galaxy, the flaming gas cloud fringing off into a scattered group of flaming stars, red and yellow and blue. He heard Karshan's voice faintly: "The sky is more interesting now. There are more stars, and less of the featureless cloud." Aarn shuddered. Less of the featureless cloud—the unformed galaxy!

"That was the sky the cold came into. The ones who tried to fight it held out for nearly ten thousand days. They really lived on the internal heat of the planet. But even that was exhausted eventually, and the chill ate in. Air became a problem, for it had frozen in lakes about them. They could no longer leave their caverns.

"We waited till that time, when the planet was growing cold, and there was plentiful frozen air to start our process. Long before, when the cold had just begun, we had filled the dams, leaving only a passage out. The solution— it had taken a generation to prepare it. There was the lower dam, and the upper dam, and beyond that, the reservoir. In that were millions on millions of gallons of solution. Lead nitrate in water. Saturated. We ran a layer over our city and over the tubular tunnel we had built to the outside. It took cold to freeze it, of course. We flowed in layer after layer, letting each freeze in place. We built up successive layer upon layer until at last over us, and our machines,

and our city of refuge was a block of ice and lead-salts half a mile thick.

"Then we blasted loose the lower gates, and opened them. The solution was frozen hard, and of course did not flow out. The time passed, and when the liquid air was plentiful, we retired, and all our people save the scientists were put in the Sleep, in tubs of liquid air.

"We waited till the ten thousand days had passed, and finally —we slept. The last man was put in his place and prepared by a special machine." Karshan paused. He had gotten a new reel from the cabinet, a reel of fine wire, and now he put this in the projector. Abruptly Aarn started. From the projector came mental impulses, the impulses of Karshan himself.

"This is the record of Karshan of Myrya on the First Awakening. Our wandering planet has drawn near a new star. The apparatus has functioned perfectly. The heat of the sun has melted the Great Seal, and the solution has flowed through the lower gates, into the lower reservoir. The primary direct photocell started operation on being cleared, and the concentrator field built up till it commenced operation. The clocks indicate the Seal was broken three thousand days ago. The atmosphere is gaseous once more. But we are retreating from the sun into space. This star has no planetary system, and we have not been captured.

"I am the third member of the first group. Two others of the seven in the group have awakened, and four failed to return to life. They have been removed.

"Examination shows that we are now headed diagonally across the edge of the galaxy, through the thickest of the star-fringe. We may hope for a second near passage soon. The first passage has been unavailing."

There followed a long technical discussion of their condition, of the condition of the machines left to awaken them automatically, and a report that all was well with them; they were uninjured.

"The other two members of the Awakened Party have set out to investigate. It is difficult, for the world is terribly cold.

We are forced to live in the Records Vault, the only place habitable. The foods are plentiful and good." There was a slight pause in the record, as though a period of time had elapsed.

"The explorers have returned with the records of those who attempted to live in the heat of the galaxy. They were unsuccessful, and the last perished after a period of two generations. The bodies of the last survivors were found huddled in a single small cavern, using the heat of the Myryan power system for warmth. The plant decayed due to the impossibility of their giving it proper attention, and the extremely low temperature. It is no longer capable of functioning. Our plant alone remains in operation.

"The cold is growing intense. The solution has been pumped into the upper reservoir, and the Seal has been re-established. The air is beginning to condense. With some difficulty we have succeeded in establishing an observatory on Mount Klor and have taken many photographs. We have been forced to retreat, as the stored power is almost exhausted, and the power plant is no longer in operation.

"We will again go into the sleep within twenty-two hours."

Silently Karshan inserted a reel of film into the camera, and the picture appeared on the wall as mental impulses came from the machine in a concluding thought.

"The radio-active ores left as clocks indicate the passage of one half the half life of the ninety-second element—" and a phrase of time that to Aarn suddenly becomes intelligible—"a period of two and one half billions of years." Simultaneously Aarn saw the picture.

Across a field of white waste, illimitable in expanse, glowed a faint, minute disc. A far-distant sun. Boiling, steaming pools of deep blue liquid lay in puddles and ponds among great masses of white, fluffy snow. A crawling, grotesque figure of a man moved in the dim light, a man in a cumbersome, cold-proof suit. The scene vanished. Across a deep-cleft valley jutted a white mountain, and beyond it the great rising arc of the gas-cloud galaxy. It appeared exactly the same. "A period of two and one

half billions of years." The thought seemed to cling in Aarn's mind. The galaxy was unchanged in that period . . .

How old was Karshan?

The picture faded just as Aarn recognized the deep-cleft valley as the valley of the city. But a tremendous mass of solid white filled it from brim to brim. The Great Seal.

Again the machine sent out its impulses.

"This is the record of Karshan of Myrya on the Second Awakening. I am the third man of the first group. One other has awakened with me, and one of the second group. The others we did not call. Three are enough for the work.

"Myrya is passing a giant red star, at a distance of nearly 100,000,000,000 miles. Even at this distance the planet has been entirely freed of the cold. There is no planetary system, and we will not be captured. The passage will consume nearly two thousand days. Much research work is to be done in this time in an attempt to find some better radio-active ore. The refined samples left at the last awakening have been 49% transmuted, indicating an elapsed period of approximately five billions of years. Myrya shows little change. The cities have not been destroyed, and stand practically perfect, torn a bit, however, by the terrific storms of the thaw.

"The seal was broken after 6000 days of light above intensity 10. Another one thousand days elapsed before our awakening. All the apparatus was found in perfect condition. It was perfectly designed. The solution has been pumped back from the lower to the upper reservoir.

"Calculation and observation from the observatory indicates that a terrible change has taken place in our course. This giant sun has deflected us, and accelerated us with its own proper motion so that we shall be hurled almost directly out of the galaxy. If this course is not deflected, we shall wander out into intergalactic space for an inconceivable time.

"There are slight but noticeable changes in the make-up of the galaxy now. The central gas-cloud seems to have contracted, and many new stars have appeared. The stellar fringe is notice-

ably broader. Perhaps it is best that we circle outward, for should we enter the gas-cloud itself, our fate would be certain. Myrya would become the nucleus of a new sun.

"We are leaving this star now. We have already pumped the solution back into the upper reservoir. I fear we will be hard-put this time, for the enormous radiation of this sun declines so slowly, our stored power may not last till we are safely out in the cold regions where we may enter the Sleep. We have discovered a new radio-active material whose half-life is twenty times that of element ninety-two. We are going again into the Sleep. The atmosphere above has not yet frozen, but our energy is exhausted. We have been able to freeze sufficient air in the cold rooms of the sleeping quarters to freeze our bodies. We will probably be safe enough.

"Investigation of those who are sleeping indicates that many of them have died. Tharsarn suggests a twofold reason for this. Many of course did not survive the original action of the drugs. This was indetectable at the time. Many more have possibly been killed by the atom-smashing rays from space. Even under our Great Seal, and half a mile more of solid rock, in the enormous times that have passed, these rays might well have been deadly. They do not influence the machines, since machines are not as delicate as body chemistry.

"That I have survived, Tharsarn believes to be due to a peculiar susceptibility on my part to the action of the drugs, and to the fact that during the periods of awakening I have renewed the entire chemical structure of my body, replacing the destroyed atoms with fresh material from the foods I have eaten. He says that we who awaken have a better chance of ultimate survival.

"Our latest calculations minimize this. We are very near the edge of the galaxy. And our parabolic orbit will lead us far out into intergalactic space.

"This concludes the second report. We have been awake three thousand two hundred and twenty-one days."

Aarn relaxed as the age-old record ended. Karshan inserted another.

"The third report of Karshan of Myrya. I have again awakened. Tharsarn has again awakened, but not until group twenty-seven was called did we get a third to join us. We revived with extreme sluggishness." A technical report followed, discussing their medical condition.

"The seal melted after an unknown period of exposure to this star's heat. Our machines functioned perfectly.

"The time that has elapsed since our last awakening is as yet unknown. Chemical analysis could detect no uranium in the purified specimens we left after the last awakening. Spectroscopic examination revealed faint lines. The new radio-active compound has some slight activity left, which we can detect with sufficiently sensitive physical instruments. Explorations have revealed no other radio-activity on the planet. Marlar, physico-radiation technician of group twenty-seven, estimates the time as approximately four hundred billions of years."

Aarn stiffened into sudden, cold rigidity. Four—hundred—billions—of years. Four hundred billion years.

KARSHAN WAS MORE THAN FOUR HUNDRED BILLION YEARS OLD!

A picture flashed on the screen. A picture of the galaxy, taken over a steaming, rocky landscape, devoid of life. Bare muddy rock stood out.

Karshan's comments droned on: "There are indications of terrific fires as the world thawed out. I suggest that the long action of the rays from space converted millions of tons of rock to hydrogen, which has burned with the oxygen from the air. Our atmosphere is greatly depleted in oxygen. The cities have been devastated. The metal of the buildings is rotten, weak, unreliable. In spots it breaks at a touch. The outer walls have been knocked down by the terrific storms of the thaw, and the burning.

"Devastation, save in Tarnsor, is complete. The very hills have been leveled. The time that has passed is inconceivable. I thought the period between our passing the first stars was enormous, but this is beyond conception.

"The galaxy is unrecognizable. It may be a different galaxy,

though I doubt it. The time is not great enough for that, tremendous though it is. I believe we circled in a vast orbit out of the galaxy, and then back in again.

"That, perhaps, has saved us for so long a time. The rays from space must be weak far out of the galaxy. Nevertheless, they have destroyed the entire surface of our planet. Dust has drifted many feet deep as a gray-brown mud, wet now with constant rains.

"And our journey has not yet ended. We are circling another star in a parabolic orbit. It is a blue-white giant, terrifically hot. The thaw has been far more complete than hitherto, and we are still approaching the star. We fear the thaw may be dangerously complete. We will approach within 100,000,000 miles."

Another picture appeared on the screen. It was a scene taken under a fiercely blazing sun. The glaring rock shimmered in the heat. The picture had been taken from a ridge near the chasm-valley in which Tarnsor lay. One of the dams was visible, and beyond it flashed a sheet of water, water almost boiling, with dense, circling clouds of steam whirling lazily around it.

"We are now at the point nearest the sun. The thaw has reached a depth of half a mile. The ice of the seas is melted to a depth of nearly a mile, and waves are dashing furiously on the coasts. Cyclonic winds have been set up by the temperature differences between the poles and the equator.

"The heat is unbearable during the day, and the chill has been driven out of the rocks, even as deep as our sleeping quarters. The air is beginning to volatilize. We are fearful of the effect this may have. Should all the air be volatilized, the sleepers will have to be awakened.

"Accurate analysis of the radio-active specimens place our time spent in the great swing out of the galaxy at between 454 and 460 billions of years. We are at a loss for radio-active material to be left when next we swing out into the cold. We will be headed directly for the heart of the galaxy—a vastly changed galaxy, a galaxy with countless millions of stars where there was

once only a glowing gas cloud—yet it may be long before we next awake, and there seems to be no radio-active material remaining. We believe that there cannot be more than one ton of uranium left in the entire planet, and that is utterly unavailable. Our world is too old, too eternally old. We have outlived the elements. Only those lifeless ash elements too low to be active remain."

A new picture appeared on the screen. A picture of a star-studded night sky, great gleaming suns hard and bright against the black of space. Across one whole side of the sky a tremendous arch of hazy light swam upward. The galaxy. Only a faint fringe of gas still glowed warmly in its center. And—distinctly visible, clear and sharp, hung two separate great clusters, isolated from the main body, clusters of stars already completely formed. Aarn gasped—the Magellenic clouds, seen as separate entities!

Karshan's report continued: "We are retreating again into the void. The air was not completely volatilized in the sleeping caverns, and it is now rapidly condensing once more. The solution has been pumped back into the upper reservoir, and it is freezing rapidly.

"We found a small source of radio-active material. By extremely laborious search with unusually sensitive instruments, we located a slight source on the continent—and investigation disclosed a fall of meteoric material that contained a small amount of radio-active matter. Our power was plentiful, and we succeeded in extracting it. It is largely radium, unfortunately, with a low percentage of uranium, and a very slight amount of the unnamed radio-active compound we had previously isolated. And now, except for the veritably impossible accident of another meteor-fall, our planet is completely exhausted. No slightest indication of radio-active elements were found, only the false radio-activity signs of the rays from space.

"This very limited supply is all we can find. We can reasonably hope, however, that it will be sufficient. Our Great Seal was an unnecessary precaution as far as meteors were concerned. Not a dozen have fallen in the endless time Myrya has wandered.

But the seal protected us against the rays of space. In the caverns dug by those who sought to live by the galaxy's heat, we found the machines disintegrated, nearly a quarter of a mile beneath the crust.

"Must we wander on thus forever? We have seen the galaxy develop from an infant gas cloud to maturity. Will we come to life again at intervals, wandering always, to see at last the galaxy a dead collection of dead stars, warmed by the light of some dying, crimson sun of minute size and incredible density?

"Our only hope is that we pass a sun with a planetary system. And then we must pass close to a massive planet. No small planet could capture us and turn our parabola into a fairly small elipse.

"We are going again into the Sleep. Our star lies far behind us, a blue-white point of light."

A final picture flashed on the screen. The galaxy was visible in only a small portion of the sky. In the center of the view appeared an intense blue-white star. And again the ground was a crystalline waste, and the stars the stars of open space.

Aarn was silent as Karshan inserted still another record.

The machine burst with triumphant mental impulses. "We are approaching a white star of large size—a star complete with a planetary system! We have calculated carefully, and we will pass within a million miles of a planet so huge it is thrice as large as Myrya! This is certain to capture us, and in an orbit of reasonable size. The results cannot be calculated accurately, for the planet is the center of a revolving system of many satellites. The effects are incalculable—but *we will be captured!*

"The seal has been released, the power of the cell-banks is being turned to the task of wakening our people that they may see this. Tarnsor has been found in perfect condition. The buildings are being warmed and prepared by the two-score who are now awake. The only blight on our joy is that only these two-score survived the terrible wait, out of the ten thousand who lay down into the Sleep in this one chamber.

"Some five thousand of our people are awake. We are passing at the nearest the giant planet that is to be our captor and our saviour. The tidal strains are terrific, but there have been only slight seismic disturbances. All that will occur before we have found our orbit we cannot foresee—but we have been captured. We again have a sun, again we are a planet in a system, after wandering for a total of 473,375,500,000 years.

"I, Karshan of Myrya, have seen the galaxy in its youth, in its adolescence, and now in its maturity. There is no longer any trace of gas in its heart. Only stars remain.

"Man lives again—his race is growing again—and he has all astronomy to relearn!"

Karshan touched a stud; a reel he had put in the projector began to turn, and on a black background Aarn saw a tiny disc moving, with ten points of light circling it steadily at various speeds. Rapidly the system drew closer, growing slowly larger, tilting as it neared them. The orbits of the ten circling points of light stretched visibly, particularly the third to the eighth. The tenth and outermost seemed to move slowly and steadily toward them. The tiny disc became larger, and in a great spiral it wandered on, while the growing disc began to loom larger and larger on the screen. The points became discs of various sizes, and at last the outer ones vanished beyond the edge of the screen. Only the planet itself remained; then finally it began to retreat again. And as the satellites again became visible, they revolved in orbits far askew. The planet had been turned aside. But Myrya was captured.

Aarn turned and looked at Karshan with a strange awe. "You—have seen all that?"

Karshan smiled. His broad, kindly face, deep-graven with lines of sheer content, lightened with a grin as human as all mankind. "All of it—and more. But I'm just human. I have felt your thoughts. I am no monstrosity. I slept, and when I awoke, time had passed. I am little more than thirty thousand days old to my own knowledge."

Aarn shook himself slightly, then he too smiled and ex-

tended his great, broad palm. "You're a man, Karshan, and a member of a race so stubbornly determined, so inflexibly set toward life, that not the cold of space nor the rays of space could stop them. The very radio-active elements died—and you lived! I'm proud to know you."

Aarn hesitated briefly. "Have you duplicate records, have you copies of these that we could take back to Earth and let our own scientists study? And above all, have you yet made a complete star-map, inaccurate though it may be, by which we can later have some hope of finding our way back? If we leave now —we would leave forever, for we would have no more idea of your location than we have of the location of our sun."

Karshan nodded. "We have. We have made you a duplicate of both reels and projector. We had thought of your wanting them, of course. It is so little we can do in return for the fuller life you have made possible for us with your inventions."

Aarn laughed depracatingly. "Any race that couldn't be stopped by four hundred billions of years of cold and night, wouldn't be stopped by a few hundred days of partial cold!"

"It is curious, isn't it?" replied Karshan gravely. "We might have been! It might have been too cold for us to live, and yet not cold enough for the Sleep!"

CHAPTER FOUR

"SO THAT'S THEIR STORY." SPENcer rose and looked out through the *Sunbeam's* pilot-room window. The white light of Tarns shone down on the rocks below them—rocks that were strangely rounded and softened. Only near the base of the chasm walls, near the city itself, were they sharped-edged and rugged. The city was a gleaming metal bubble deep in a great cleft. Below and above, the crumbling dams stood gigantic. Men and women were working in that city. Men did the heavy work, while women had taken charge of statistical analysis, laboratory routine, and similar activities.

All were incredibly busy. Despite the wonderful machines the Myryans had developed, and the complete miniature metal-working plant set up here in Tarnsor, the task facing them now was gigantic. A ship was being built, a tremendous sphere, eleven hundred feet in diameter, equipped with a tiny power plant that would lift it and move it slowly. The walls were scarcely two inches thick, the girders merely wire cables.

Six smaller ships were also under construction, these equipped with powerful engines employing the momentum wave drive. The greater ship was to be the power station, revolving in an orbit about Myrya just beyond the atmosphere, and so oriented that the sun-tapper beam that would reach from it, would have an uninterrupted path to the sun. It would be a great charging station, where huge aggie accumulator coils would be charged. The smaller ships would carry the full coils to Myrya, and the exhausted ones back for charging. With plentiful power,

and with the efficient aggie coils, this was an economical procedure. Indeed, no other system was possible, for the ionized layer of atmosphere high above the surface would have short-circuited the transpon-beam as it reached out from Myrya to the sun. The result would have been such a colossal flood of energy—the angry answer of a short-circuited sun, generating quintillions on quintillions of horsepower hours each second—that the entire region would have been dangerously blasted, and the immediate locality turned to a pit of molten lava.

Other work was being done too. Small ships of the *Sunbeam* type had been made, and already apparatus was being hastily manufactured by great stamp-presses and automatic machinery, and was being shipped to twenty stations scattered with comparative uniformity over all the planet. Each of these stations was in an old city, and the ruined buildings were being torn down to supply the vast quantities of metal they needed for the new construction.

Tremendous holes, all of five miles in depth, were being bored into the solid rock crust of the planet by mechanisms patterned after the Shal torpedoes of the Magyans. At the base of each tube was a projection cap which would distribute the momentum waves Aarn's apparatus would generate, spreading it through the deeper mass of Myrya. Scrap metal, fused in the base of each pit, gradually built up tremendous rods which would become part of the planet-shifting apparatus.

"It won't be a matter of days, by any means, or hundreds of days," Aarn had emphatically explained. "But within two of your years you should be able to twist the planet's orbit to what you want. In the meantime, within a hundred days you should be able to turn the axis of the planet so that it is vertical to the plane of the orbit. You can calculate the precessional effects, and make them help you. But *don't* rush. If you do, that set-up will tear the crust right off the planet!"

The great hull was already rising outside on the broad landing field, and Spencer watched its growth thoughtfully.

"If that's their story, then certainly a little thing like turning

this planet won't bother them," he commented. He looked about him. That city was older than the sun that lighted it. It was older than the stars that shone down on it at night. The rocks of this incredible planet had existed before the stars were created. The men working on that ship—some of them had been old when the stars were young, when the galaxy was yet unformed. "When are we leaving?" he asked as he turned away with an involuntary shudder. "We still have to find our own sun, you know."

Aarn nodded slowly. "They affect me the same way. Those rocks, that city. Even those men. It's harder to believe it about them. But—when you think of them it's even more—upsetting. They're fine, human, friendly—yet they have seen the galaxy grow old, and stars die; and the very elements of this world are dead.

"You know better than I when we can leave. Are they clear on engineering details? They've got the physics. They can catch that. They're brilliant." He chuckled mirthlessly at the thought. "Brilliant—they've had time to be."

"They'll have all the engineering difficulties straightened out in about a week," said Spencer. "After that they have brains to go it alone."

The week passed; and from the landing field beside the city of Tarnsor, the *Sunbeam* rose slowly, almost reluctantly. She was not alone, for with her rose two of the newly-completed space ships of the Myryans. They accompanied her to the limits of her 2000-mile-deep atmosphere. Then—the *Sunbeam* disappeared with speed greater than that of light.

"Yet in a way—I hate to leave them," Spencer said softly. "If you think only about their utter humanness, you marvel at their dogged persistence and the indomitable will to live that they displayed. They slept through all eternity—and lived again."

BOOK TWO

THE INTERSTELLAR SEARCH

CHAPTER ONE

AARN MUNRO TURNED AWAY from the wide panarama of unfamiliar space visible in the screens of the *Sunbeam*.

"We've got a worse problem to solve than that of the Myryans, and in something less than a quarter of a century," he pointed out. "We've got to find, not *a* planetary system, but an *inhabited* planetary system!"

"There's somebody in this ship with a lot of cock-eyed theories about planets and planetary systems, though," Spencer remarked casually. "One system for every 100,000 suns."

Aarn grinned. "You're mistaken, my lad. That was no theory of mine. I merely repeated another man's theory. And remember, please, that we Solarians haven't had any reason for such an intensive study of planetary theory as the Myryans have had. Their theory includes ours, and adds a more important second cause for planetary development. Double stars, driven farther and farther apart by tidal action and friction, sometimes produce a planetary system, and two free stars. That's not any fault of mine."

"What's the plan?" asked Bob Canning, looking in from the power room.

"Seek, and ye shall find—maybe," replied Aarn. "We're headed back into space, and then we'll start the campaign again. Incidentally, I aimed for the center of the galaxy when we lit out. We may as well start in the right general direction. Plus the fact that planets are more apt to be found where stars are thicker."

"Going to use the transpon-collector system again?"

"No—the Myryan light collector. Far more efficient. It collects the light as light, and can give us spectroscopic examination. That may be a help."

Two days later, it was being a help. Aarn was examining the stars spectroscopically now, as well as measuring the light-intensity. He tested ten stars in two days, with negative results. Ten more in another two days. Day after wearisome day passed as star after star was tested; and the *Sunbeam* continued flashing toward the center of the galaxy.

Twenty days of constant searching, with one hundred stars examined, and no results. A month, and no planetary system.

"Maybe," said Spencer in disgust as the last results checked out at zero, "your original estimate was right. We haven't found another planet since."

"Oh—don't give up," said Aarn good-humoredly, "it's grand research. Just think of all the data we're collecting. We have accurate spectroscopic results on nearly 200 stars. That's mighty useful work."

"And there's no use giving up," Carlisle reminded him. "Even if you get peeved, you can't go home, you know. And if you want a job, try working this math for a change. I'm getting a little sick of it."

"How about power? Isn't it about time you visited a star for more?" Spencer inquired. "I'd like to look at one close up just for the fun of it."

"I'd intended doing that presently. I'm going to take another set of readings, and then move up to that star I've had in my eyes for the last fifteen days. I've been expecting to pass it for the last ten. That blamed thing is no piker—even after what we saw from Magya, and Anrel. It's a cB8 star—which same means a surface temperature so hot it would crisp a tungsten atom. I'm going to toast my toes over there."

The readings were taken, and the *Sunbeam* started toward the enormous jewel of space Aarn had pointed out. It took three days to reach it, but at last they neared it, and stared at it in won-

der. It was a magnificent thing, a vast sea of darting, swirling violet flame, an intense furnace, ringed with light. Its radiance faded through the spectrum to red; then it hurled out a vast, far-flung corona for over fifty-five million miles, a prominence glowing with brilliant scarlet streamers of flame. At a distance of 10,000,000,000 miles the heat was intense, and Aarn had at once placed auxiliary glass ray-screens that cut out 98% of the incident ultra-violet. And still, the next day, their skins were raw and sore from the ultra-violet burns! The star radiated almost entirely in the violet and ultra-violet range.

"If," said Aarn, "that thing had planets, which it hasn't, and the planets which aren't there had people, the people who aren't on the planets that aren't there would have to be moles, or else have a two-inch ray shield for a skin. That flood of ultra radiation would burn holes in rocket engineers' asbestos pants."

"Aarn must be collecting energy for a long trip," commented Carlisle, "he picks 'em hot when he picks 'em."

"I'll have to get in close with that by-pass field," admitted Aarn. The *Sunbeam* leaped into high speed again, and the star became ghost-like, tenuous. It expanded like an inflated balloon, then collapsed as though pricked, and disappeared. Space was utterly blank and black. "We're about 10,000,000 miles from it now," Aarn said, "and if it weren't for that by-pass field, we'd be fused in seconds. We're within the corona discharge, actually, though that's not particularly hot—except by picking up radiation from the photosphere." Aarn began manipulating controls—and suddenly the tremendous sea of fire hung straight before them.

"Wow! That's no ten million miles!" Carlisle yelled. The enormous disc was smoky violet, fiercely glaring, spread over all the visible area of space, save for one tiny corner, where a solid sheet of wavering red flame appeared. Aarn was working rapidly, his motions swifter than any Terrestrian could have made with his slower, earth-trained muscles.

"Yes it—is. It's just big. We're drawing all we can carry when the—beam gets—ah!" They were almost deafened by a single clap of thunder from the transpon beams in the power

room that carried the picked-up power from outside into the aggie coil beams. The concentrated blast drove the air out of its path as effectively as a bolt of lightning does. It chuttered and sputtered, making Aarn's comments inaudible. He made some change in his controls, but for seconds more the beam roared and cracked. Then rapidly it died into almost complete silence. Aarn made another movement, watching his dials intently as he continued speaking. "It's almost as bad as Anrel. I'm using that gravito-magnetic by-pass. Converts electric to gravitational field. Makes light and so forth pass through the ship and through us as though we weren't there." He paused briefly. "That ought to be enough. The coils have got all they'll take now."

The sea of dusky violet flame died out gradually, then reappeared suddenly in ghostly form as the *Sunbeam,* shooting away now, overtook light that had left before them.

Carlisle looked at Aarn dubiously. "Are we going to that fool Cepheid? Anrel was a Cepheid, and you studied that plenty."

"I didn't study it. Those Magyans had, though, and it wasn't a Cepheid; they never heard of stars like that in Magya's space. I have plenty of data on their sun, and the astro-physicists can get busy on it. But I haven't any on a genuine Cepheid, and this is one, I think. I'd like a vacation of research instead of that steady grind of looking at meaningless suns."

"I'm not kicking—just questioning," Carlisle said hastily.

"It wouldn't make any difference anyway," said Spencer sadly. "The Bull of Basham has lowered his head and is charging. Nothing but something more interesting would stop him."

Aarn grinned—and went on.

Day after day passed, and the Cepheid grew brighter and brighter. Cepheid stars are universally extremely brilliant, and this seemed no exception—until, as Aarn began taking readings regularly, he discovered to his amazement that it *wasn't* a Cepheid. It was some other type of regular variable. They were covering light years, and that meant years of radiation that they

were able to study. Gradually the frequency of the cycles was increasing, and apparently at an accelerating pace.

"That," said Aarn excitedly after his last reading, while the light of the strange star gleamed brilliantly in the ship, "is about to become a Nova! It's evidently one of those giants on the branch line of Russel's diagram, and about to fall to a normal main-sequence sun. We're too close now to hope to see it turn Nova by moving nearer. I think that even in real time it hasn't yet—we're only half a light year away now."

"Will it be safe to investigate—?" asked Spencer doubtfully.

"Certainly. We can hang far enough away."

"You won't know how far is far enough. Either it is or it isn't, isn't it?"

"If is is is, is not is not is not?" grinned Aarn. "I take it you mean that, should the radiation commence suddenly and violently, explosively in other words, we wouldn't know it was coming till it hit. First, a star is too massive a thing to do anything suddenly. It would probably take several days for it to reach a maximum. Remember, at the speed of light, radiation would travel from the heart of a good sized star to the outside in not less than two seconds, but since no conceivable radiation *can* travel through a star at the speed of light, that's out of the question. Anyway you figure it, the time will certainly be days, so we'll have plenty of warning."

They returned to the control room, and again the *Sunbeam* leaped forward, and rapidly the star ahead expanded, till at last the brilliant point became a brilliant disc, shifting slightly from the center of the center panel as they neared it. "Missed my aim slightly," Aarn commented. "We'll circle it a bit as long as we're out here." They halted their speed-motion, and the star became visible as a real thing instead of a ghost-light.

Aarn looked toward it, and began taking gravitometric and momentumetric readings. Gradually a frown of puzzlement came over his face. "These instruments show a moment of momentum that's terrific. To have a moment of momentum

like this that star would have to turn on its axis once in about a quarter of an hour. The only other explanation—" Aarn was busy, still wearing a puzzled frown. Gradually it dissolved in surprise as Spencer and Carlisle watched. Finally he chuckled, "Of all the dumb-blind luck! This blamed thing has *planets!* After all our laborious search, our careful investigation of spectroscopic and photometric results, we find planets by accident! It's no wonder we missed 'em. They were rotating in a plane at right angles to our line of sight, and therefore there was very little light-variations caused by them, and that last in the variations of the star itself.

"Planets! I'll be burned!" Spencer laughed. "Hunting all over space—then stub our toes on' em."

"How many, Aarn?" asked Carlisle.

"Four big boys. Two within one hundred million miles of that sun. One at a distance of seven hundred million, one at about eight hundred. Hmm—wonder if they're inhabited. If any of them are, it would probably be Four or Three. One and Two are too hot. Three's a warmish world for us, and Four's a coolish one. All depending of course on the composition of the atmosphere. If Three has a lot of plants that consume almost all the CO_2 loose, and Four has plants that don't take anything below one and a half per cent, and a lot of broad sea-surface, then Four is hotter than Three."

"Transparency of atmosphere you mean?" asked Spencer.

Aarn nodded. "Carbon dioxide and water vapor act a lot like a layer of glass—they'll pass short wavelengths, but stop long—comparatively speaking. Light and short heat waves pass through them easily. The light and heat energy reach solid rock and soil or liquid water and are absorbed warming them. The rocks and soil of course—radiate—but their radiation is long wavelength heat rays. Infra-infra-infra red, as Aarn called it. Carbon dioxide and water vapor are as transparent to that as a layer of solid rock.

"But what I'm thinking about is the situation of the peoples of these worlds—if they are inhabited. Pleasant idea—talk about

living over a volcano! They're living over one that's nearly two and a half millions of miles across!"

"Why not investigate?"

"I intend to. We'll start on Three—it's nearest."

The *Sunbeam* leaped forward, her momentum drive in action. In minutes they reached a speed of nearly ten thousand miles a second. Three swam nearer, enlarging swiftly. Aarn slowly pulled back the drive control, and the transpon beams died out. Planet Three was within a hundred thousand miles, and Aarn was busy with a second complete control board. A tiny thing, no larger than an egg, if that egg be an ostrich's, started out of a pocket in the side of the *Sunbeam*, and darted forward, out of sight in a fraction of a second. A screen came to life, on it a picture of the planet below expanding swiftly.

A sea, broad and deep blue in the twilight region, with an edge of a continent just advancing into the light. It was early morning. Rapidly the land extended, and the sea became invisible. Aarn's investigator began slowing down, as the outskirts of the atmosphere were reached. Aarn was investigating the instruments below the screen now. "Surface gravity 1.58 Earth's," he announced. A broad expanse of level coastal plain was visible. It was an unbroken expanse of forest.

"There *must* be animals," said Aarn. "All that plant life—"

The little investigator was sweeping in broader and broader circles, whining through the air at hundreds of miles an hour as its minute but powerful momentum drive sent it on. Inland—over the continent. One hundred—two hundred—then Aarn sent his stop signal as the image of a distant city appeared on the screen! The Investigator stopped some five miles beyond the target, turned, and cruised slowly back, miles above it. It was a huge city, sprawling in orderly disorder in green-blue sunlight. There was a massive district of great buildings, and a diminishing outer circle of suburban places. Still more slowly the Investigator dropped downward, till it approached the central district.

Slowly the scene expanded, the outer edges crowding off the screen, the central district growing in size, with a strange lack

of perspective. Flying things became visible as darting shadows, then smaller, the machines on the street level, and finally black streams of moving inhabitants. With a nerve tensing slowness the investigator descended. The machine took a sudden drop as Aarn sent another signal, slid abruptly and swiftly down close to the side of a mighty upreaching building. At about five hundred feet it stopped, and held motionless. Aarn and his friends stared in amazement.

There were *two* kinds of beings down below, consorting in perfect freedom! One was a race of ten-foot creatures unbelievably repulsive. They were dark green, and shiny. They were draped in a simple type of loose garment half way between a toga and a very loose-fitting pair of pajamas. Their faces were triangular, with wide triangular mouths splitting them. Small mobile cup-shaped ears rose just above the top of the "face," and great round yellowish eyes at the base-points of the equilateral triangle completed the picture. The surface of their bodies, and their faces, was a meshwork of fine, glinting dark-green scales. They were reptilian, without a doubt.

But they walked upright on two long, stout legs, and they had two extraordinarily long and powerful-looking arms, jointed seemingly in a most indiscriminate fashion from the way in which they maneuvered them. "Two joints—two elbows!" said Aarn blinking his eyes and shaking his head.

The other type of being seemed quite human, a sort of golden man. Their bodies were less stocky than the reptilians, and they appeared to walk with some slight difficulty. Each was about five feet six in height, with smoothly muscled arms of a perfectly normal type. Their faces were broad and pleasant, but rather stupid looking. They wore only a brief type of shorts, both males and females. Their numbers seemed about one tenth that of the reptilian people, but they mingled freely with them.

"Well, well. We've not only found people—but two of them. What next?" Spencer turned to Aarn with a wide grin of interest.

"A bit of thought. I *think* it's safe to go down. What say?"

"Why not? They seem pleasant enough. Getting along between themselves, and that one race is certainly a lot like us externally. We ought to get by."

"I agree. So—" The *Sunbeam* suddenly darted down in flashing speed, circled the world briefly, and shrieked into the atmosphere of the planet almost directly above the city. There was a wide expanse of park-like development beyond the outermost suburb of the city, and Aarn headed toward it—only to stop as he saw a huge egg-shaped ship slanting in for a landing on a great broad park-square in the heart of the city.

"Landing field there. We'll head for it."

The *Sunbeam's* angle of flight changed slightly, and she dropped more slowly downward. The people who had begun to disembark from the now-landed ship below, suddenly scrambled wildly back into her, or raced for buildings on the edge of the field. In seconds the *Sunbeam* had landed gently, and a stream of reptile men broke forth from one of the huge buildings bordering the field, coming in a swift strange gallop, their double-jointed legs giving them amazing speed.

They slowed, finally, and looked rather bewildered and foolish outside the *Sunbeam,* staring at her with great round eyes, their disconcerting mobile ears turning this way and that. Finally one who seemed to have authority advanced gingerly toward the front of the ship, and looked in at the control window. His broad reptilian face split in a grin as he did so. Inside he saw Carlisle busy with his atmosphere tests, Spencer looking out at him, and Aarn working at a control board. Suddenly there was a rushing *whoosh* in the air, and the officer jumped ten feet away as something egg-shaped and silvery shot through the air toward the ship. It seemed to vanish into the blank wall, so swiftly did the Jovian-trained Aarn bring it in through its port.

"We can breathe it," announced Carlisle at last, "but it certainly beats me as to composition. I can't believe it, but my titanium won't burn, which shows no nitrogen is present in any great quantity, there's oxygen—about 18%—but the Tefflan catalyst for burning of nitrogen and oxygen doesn't react either.

Spectroscopic work I left to you, Aarn."

In an amazingly short time he announced: "Oxygen—helium—nitrogen—argon—carbon dioxide—neon, xenon and of course water. Well equipped with rare gases!"

"No wonder my titanium wouldn't react. That gang wouldn't react on incandescent ceasium once you got the oxygen and water and CO_2 out. I'll bet that nitrogen is a trace."

"Healthy trace," said Aarn softly, checking further. "About five per cent. That catalyst wouldn't work of course, nor titanium. But we will. No element other than those I mentioned. Let's go see our green-faced friend. He looked anxious."

"He's plural," announced Carlisle. "The regiment's come up. Watching with interest."

"We'll go into the air-lock," Aarn said, "and fasten the inner air-lock door, and then step out, just to make sure no one presses the wrong stud. That might be bad."

"I'm going along," announced Canning, sticking his head in as Aarn and his friends started toward the lock.

"And I don't wish to be left alone, sir," objected Martin, "those crocodiles are most unpleasant looking specimens. I feel we'll be safer together."

"Very well," Aarn nodded, "you can go with us."

They walked to the lock, entered the chamber, and rapidly let in external air to make their pressure equal to that outside—and all five Solarians slumped quietly downward, just as Carlisle made a quick, half completed gesture toward the valve control.

Sharblox, Officer of the Day at Karatawn space port waited a good five minutes before making any further move. "I think," he said at length, "it will be safe to investigate. They evidently entered their lock, and are showing no signs of activity. Probably their air pressure is lower than ours and they drew the *shalssa* in to themselves. That is well. There must be some external means of entrance."

CHAPTER TWO

CARLISLE WAS LAST TO AWAKE. He had been struggling violently when he went under and the effects lasted longer. Aarn was looking down into his eyes.

"It—it—Randite—sleep—" Carlsile gasped.

"Quite right. Little late with the warning," Aarn replied easily. "We made a mistake. Quite natural—but very annoying. We've been waiting for you."

Carlisle sat up. He was in a rather pleasant room, barely furnished with six metal bunks covered with a grey rubbery substance. He lay on one of them. Directly before his eyes was a long narrow window cut into a thick wall of grey-white stone. There were silvery bars set across the window, however, and only beyond them shone the strange violet sky. Brilliant greenish sunlight made a long narrow line across one side of the room and the floor. This side of the room was also of stone, grey-white stone neatly fitted and joined. Carlisle turned, and noticed that the opposite side of the room was formed largely of handsomely polished silvery metal bars, fitted at pleasing intervals with horizontal bars. On the opposite side of the bars were two of the very human race they had seen before. These were far more intelligent looking members of the race. Now they looked rather downcast.

"The word is not prison—rather quarters—barracks. Our slight mistake was in taking the relationship of the reptilians and the humans as friendship. Its quite otherwise. Seems that the Seeset — our reptilian friends — regard the Tornans — hu-

mans—as useful slaves. I haven't got the whole story. These Tornans have a quite original idea of logical word-order. Their thoughts are a wonderful hodge-podge. They put all the verbs at the beginning, add all the nouns, then finish up with a sprinkling of adjectives. They keep 'em straight by a wonderous system of declensions and so forth. Don't care for it myself."

"The ship—I smelled the damn stuff—couldn't hold up." Carlisle was sitting up, still looking quite sick.

"So did I—but I thought it was the atmosphere of the blasted planet."

"I did at first—then recognized it. The only gas capable of causing harmless sleep even in great dilution. They must use it to quell civil disorder."

"Slaves—only slaves. They aren't affected by it themselves."

"We're—slaves?"

Aarn grinned broadly. "So they think." He winked at Carlisle, and so swiftly his motions were scarcely perceptible, he placed his two enormously powerful hands on two adjacent bars of the cell, great writhing snakes of muscle suddenly bulged under his shirt, and the two bars bent several inches. Carefully Aarn bent them back. "To be used only at night. We're moving out. Mart Toral, our friend here, has been explaining. He says we can't make it, but I think we can."

Carlisle turned toward the two Tornans staring in at him through the bars. "Why can't we escape if my friend can break out of this cell," he asked, telepathically.

The general idea, as Carlisle received it, was that there was only one exit, heavily guarded by Seeset with both gas and *sharls,* some type of deadly, flame-throwing hand gun, an impassable barrier.

"We could," said Carlisle softly, after feeling through his pockets, "pass the men—if we could pass the gas." He drew six tiny black capsules from his inner pockets and his watch pocket. "They didn't know our tailoring fashions very well," he grinned.

"Dark bombs!" Aarn suddenly racing through his own

pockets. "Two," he sighed at last, producing a pair of tiny capsules from his watch pocket.

"What are they?" asked Mart Toral.

"Dark bombs—two of these and it will be utter night for twenty feet around in the open air, fifty feet of that corridor. They throw out a substance that floats in the air and absorbs all the light. I've been carrying these since Carlisle invented them!" He looked at them joyfully.

"I haven't any," admitted Spencer ruefully. Canning and Martin had none either.

"Well—eight ought to be enough. If we can pass the gas," said Carlisle. "Exactly what is it?"

Mart Toral explained. There was only one exit, and it was kept full of the heavy sleep-producing gas, because it had a stretch two hundred feet long that was so low the gas hung there. The Seeset weren't affected, and the Tornans simply went to sleep when carried through, and couldn't possibly walk through.

"Stop breathing and we can run," suggested Aarn.

"Oh no—specially designed to prevent it." Mart Toral said sadly. "There is a door half way through. It takes—two minutes to open, from the inside."

Aarn looked at Carlisle helplessly. "You can't make it, Aarn, even you. We certainly can't."

"We can't jump out of the window. It's two hundred feet."

"With this gravity and a half I couldn't stand more than a ten foot drop," Spencer pointed out.

"What are we going to do? They give these Tornans some sort of a drug that makes them stupid and obedient before they allow them loose as slaves. And we've got to get back to the ship."

There was a dry slithering shuffle of feet down the corridor, and the ten-foot bulk of a Seeset appeared, accompanied by two Tornan slaves, dull, empty-faced creatures. Each bore a tray of some sort of food. On one there were six dishes, on the other two. In utter silence the trays were slipped through a little grated slot, the slot closed, and the men retreated with the Seeset.

"Supper," grimaced Aarn. "It wouldn't feed a healthy bird."

"It would feed a healthy human. You're oversize. I'm hungry," said Spencer unkindly. He started for his portion, but Carlisle stopped him. "A bit of chemistry first. I want to ask Mart Toral some questions. Huh—they must use salt as a staple food." There was a three-inch deep basin of salt on the tray. Mart Toral and his companion were already busy with their food, putting in a half teaspoonful of the salt.

"Their body chemistry is *not* like ours," Carlisle decided emphatically. "We'll have to go hungry. I'm afraid of it. Mart Toral—what is this white stuff."

"Salt," said Mart Toral in evident surprise.

"Do you know of what elements it is composed?"

"Oh—certainly. *Kartalakordarfortalporn.*" He hesitated in puzzlement. "I do not know how you talk by the mind in this manner. I can scarcely comprehend, but I know that means nothing to you. How can I tell you?" he asked.

"There are ninety-three known basic elements. You know that?"

"Ah—we know only ninety-one. Yes, but—ah, the table! This is made of elements—" he counted mentally to himself—"—six—eight—and eleven."

Carlisle did some rapid mental gymnastics. "Ah—" he tasted the salt gingerly. "Simple sodium carbonate. Must be the full carbonate or he would have added element one." He looked doubtfully. And then slowly a broad, broad grin began to form on his face as he looked at the walls of his prison. "Aarn—one of those silver bars out of that window—where it'll be missed least!" Silently Aarn crouched, leaped, and sprang up some fifteen feet to the window, grasped a bar in his great fingers, and in ten seconds was back to the floor with the metal rod. "Fine," said Carlisle, and attacked the greywhite wall under his bunk. Chips of the stone broke under the prodding point of the rod. Carefully he examined them. He tasted them, worked on them with a bit of metal in his clothes, and grinned more broadly.

"Mart Toral—we are cold. Very, very cold. We come from

a much warmer planet, and the cold is weakening us. Tell the Seeset in whatever way you can that we need a fire. What will they bring us?"

"Nothing," replied Mart Toral promptly.

"Ah, but make it strong—we aren't Tomans. We came from a far distant world. We are important specimens, and we are cold. We *must* have fire. Then what, if anything, will they bring."

"If anything, a charcoal fire."

"Ah, excellent. Get started, and if they bring us water too, we'll be out of here, for all their trick time-door!"

"I'm not cold. I'm broiling," commented Aarn.

"You'll be lots worse off before this night's over. I see the sun is setting soon. How long will the dark last?"

"Twenty-one hours," Aarn replied.

"For the next twenty-one hours you're going to sit close to a hot charcoal fire and help blow it hotter," Carlisle grinned.

"I suppose I'm included?" Spencer asked wearily.

"We couldn't leave you out. We need you all. I see Mart Toral has started his act. Come on and huddle." Obediently but doubtfully, the Solarians clustered closer, as though seeking warmth. It took nearly half an hour for Mart Toral to attract a Seeset. The ten foot reptilian came slowly when he came, and looked at Mart Toral angrily. Suddenly he burst into a chorus of involved, rather musical sibilants and gutterals. Mart Toral answered in a similar manner. He gestured, hissed, waved his hands, pleaded. The Seeset looked at the huddled strangers, and hissed sharply, negatively. Mart Toral spoke again, longer.

There was a gutteral answer, at length, and the Seeset went away. Mart Toral wiped his forehead, and pushed a mop of silky golden-brown hair from his eyes. "He would not believe. But he will bring water and fire. I told him very pure water without salt. The salt would poison you. That was right?"

"Quite. Any idea how much he'll bring?"

"The weight of a man, probably," Mart Toral answered.

An hour later the metal food-bowls had been emptied, and the salt was gone. Also all the salt Mart Toral had received. A

slave Tornan came for the bowls. Each of the Terrestrials had a little fire going in his, and was huddled over it. Mart Toral sent the slave away. No Seeset appeared—but half an hour later the slave came back with a supply of charcoal for the metal brazier they had been given. The water tank stood in one corner.

Dark came. The Terrestrians were visible huddled about the red-glowing fire. The rest of the cell was dark. Mart Toral, whose super-sensitive ears made him valuable, was crouched close to his cell-wall listening for feet of Seeset. Aarn was not by the fire. He was working with a silver bar in his powerful hands. A quarter of a block of the rather soft stone was gone. He knew what Carlisle wanted now. The four others were taking turns blowing hard on that little fire, their breath coming heavy, yet the fire did not burn too hotly. For there were a number of small bits of the stone in there—calcium carbonate! Limestone—being burned to calcium oxide.

Carlisle was through with the first part of his work. There were three bowls full of concentrated sodium carbonate solution.

Two hours passed. With a pair of metal tongs, Carlisle carefully extracted the red-hot calcium oxide, and laid it aside. It cooled rapidly, while a new batch was burning. Presently he dropped the cooled stuff into one of his bowls. It steamed and vapor rose with a violent hissing. The lump crumbled rapidly and in a moment was submerged. Carlisle added another. The liquid boiled visibly now. In moments the reaction stopped, and under the dim red light of the fire, Carlisle examined it. The men whispered softly. They returned to their work, blowing the fire steadily. Hours passed, and time after time the bowls hissed and bubbled. Aarn took off his shirt presently, as he stopped scraping at the hole he had made under Carlisle's bunk. The great block of stone was half gone, his silver bar broken and worn down. Even his great arms were tired, and he rested quietly while Carlisle finished his work. The fire burned lower now, the men still huddled about it. There was a soft ripping of cloth, Carlisle's figure barely visible in the dim light. He was working over his bowls again, with lumps of the white calcium oxide.

Spencer was busy grinding lumps of charcoal to an impalpable powder. "Explanation of the forests we saw," Aarn whispered softly. "No coal here. They have to raise forests for charcoal."

"Uh-huh. Shut up. I'm busy. Give me some of that charcoal." Carlisle's whisper was tense with effort.

"It will be light in two hours," Mart Toral said at last.

"I'll have these ready in ten minutes," promised Carlisle.

"What are they, Earth men?" asked Mart Toral curiously.

Spencer answered. "Gas masks. Carlisle knows all about this gas. The masks he has made will stop it and many others. Sodium carbonate—that salt—reacts with calcium hydroxide, which we made by roasting calcium carbonate of the walls to calcium oxide, and treating it with water, to produce sodium hydroxide. This he concentrated to a strong solution, and finally boiled out to a solid powder. He mixed it with calcium oxide, and charcoal. Fine charcoal will absorb gases as dry ground soaks up water. Sodium hydroxide and calcium oxide react with the gas to stop them. When you wear these masks, breath *in* through them—they will be over your mouth—but breath *out* through your nose. Do you understand."

"Ah—a wonderful chemist! From a prison cell he contrives protection— Aye, I understand. What is your plan?"

"We haven't any yet," replied Aarn, "except to tear down these bars, and yours, and use the bars for weapons, the masks for protection, and hide in the darkness of the dark bombs. We can get out of here. We'll hide somehow in this city, and finally find our ship. Then — we'll teach these reptiles respect for strangers."

"*Aybu*—I doubt it. They have mighty ships that will drown yours in a hell of fire in half a second." Mart Toral shook his head.

Aarn smiled. "We'll see when we get the ship. Have you any idea where it is?"

"Yesssss—maybe. You know why I was imprisoned?"

"We've been too busy to wonder," Aarn smiled.

"I was chief of the spies of my people on this world. They

found this out. I, and Thor Mant here are all who survive. I had been here for nearly fifty days, and learned much. I think I know where they would take your ship. They have a great shipyard on the outskirts of the city."

"Was that the tremendous roofed area?"

"Aye. Nearly two miles long, and one wide. A great shipyard. Roofed, that our telescopes might not peer within. Your ship will be there. How to get in, I don't know."

"You know how to get there?"

"Easily."

"Then we shall go there," announced Aarn.

"I'm ready," sighed Carlisle, straightening his back. He passed out seven strips of cloth, with a broad thickening in the middle of each. "Tie 'em back of your head. Better do it now." The others started to do so.

Silently Aarn walked to the barred door of their cell, braced his enormous strength, and pulled. Slowly the heavier bars of the door yielded, and at last two were out. "That's enough," he decided. "They're tough." He picked up one—a four foot length as thick as a man's wrist, and hefted it. "Nice club." In seconds he was at work on Mart Toral's cage, and easily pulled out six of these lighter bars. Wonderingly the Tornans watched his tremendous muscles working.

"Take one each—they'll make grand weapons."

Swiftly he adjusted his mask, and Mart Toral took the lead. He lead them down the corridor, around a turn, dimly lighted by farspaced bulbs, then down a winding spiral from which other corridors branched off onto levels. There were numerous other inmates—but they had no time to wait for them. Down—down—down.

"The Gas Corridor," whispered Mart Toral, pointing to the end of the spiral. His voice was muffled by his mask as he adjusted it carefully. "There will be guards at the far end. None this side of the door." But this level was better lit, and they saw open doors. Tornan slaves slept here, attendants of the prison. "Beyond the door are the quarters of the Seeset guards," Mart

Toral explained. Swiftly they went down into the gas laden atmosphere. They experienced no difficulty! No slightest drowsiness touched them. In seconds Aarn had reached the door, and turned the great handle. "Have they no alarm on this?" he asked Mart Toral.

"None," replied the Tornan. "What use? There is no escape from this prison. None from the city. Still less from the planet."

An eternity passed before a faint click in the heavy metal door told them it was loosed. Aarn pushed it. It swung open—on a corridor ablaze with light, and lined with armed guards sitting on curious one-legged stools. Simultaneously Aarn and Carlisle pitched their darkness bombs. With faint crackling explosions, the light was abruptly sucked out of the corridor.

"Carlisle—Spence—right side," Aarn snapped. He took the left. His terrible mace, a metal bar weighing nearly seventy pounds, whirled in his grip like a switch. Twice it touched flesh that crumpled screaming under its terrific blow. Beside him he heard similar crashing blows of metal on stone, and on hissing flesh. Then a cry—human.

"Aarn!" It was Carlisle's voice. Instantly Aarn leaped toward it in the dark. There was a scuffling, a slithering of hard scales. Aarn reached out, felt some scaley member under his grasp, and closed his terrific grip on it instantly. There was a hissing scream of pain, then suddenly the full fury of the Seeset was turned on him. But something cracked in his grip, a broken bone. Aarn dropped his bar, and his other arm came into play. He'd located his antagonist, and with all the power of his arm—heavy as an average man's body, and solid with muscle, he lashed out at the Seeset. The thing hissed—and collapsed as Aarn's arm broke through something and came away wet and sticky. Aarn had the bar again in a fraction of a second, and started forward. "All right, Carlisle?" The answer came, "Yes—he almost had my mask." Metal bars were clashing again on stone and flesh.

Somewhere an ululating cry, mechanical, sounded shrilly.

And almost simultaneously Aarn realized they were outside the building. His bar met no more metal walls.

"Mart Toral!" he called. Suddenly he felt the Tornan near him.

"*Ashur-hyal*—" The Tornan grasped his hand and pulled. Swiftly Aarn caught hold of Carlisle, and together they sped on. In seconds the dark thinned around them, and they were aware that they were in a dim-lit park. "We must find clothes," Mart Toral said quickly. His eyes were roaming swiftly. "Ahh—" he was off at a run, with Aarn close beside him. Spencer and Carlisle and the others waited behind the sheltering bushes. A nearby path bore a group of five hurrying, laden slaves, dressed in the simple trunks of their status.

In thirty seconds Aarn was back—half stripped already, with the five pairs of trunks on his arm. "Into 'em," he snapped, passing them out. He was in his quickly. Sounds were growing back there at the entrance of the prison. Spencer and Carlisle were shedding their clothes with hesitancy. They felt foolish in the abbreviated trunks. Mart Toral and his friend were already so dressed. In less than a minute they started on, following the Tornan. "Your color—but we cannot help it," was all he said. The commotion at the prison was quieting to a steady, directed search. Someone entered the edge of the park—a group of two Seeset, heavily armed, their guns in hand as they prepared to start. Aarn waited behind while the others sped off through the shadows.

He joined them seconds later, two of the deadly sharls in his hands, a smile on his face. "They stumbled over me," he explained. "They didn't make a sound."

"I noticed that," Spencer grinned. "How do you work these?"

"There is a stud in the handle—here," Mart Toral explained. "When pressed the energy is released. It is effective up to six times my own length. Beyond that to a distance of ten times my length it paralyses."

"Where are we headed?"

"By back streets to the most densely populated of the slave districts. We will wander through it—and never come out. So the Seeset will find."

"Friends *are* useful," Aarn admitted smiling. "They can color us?"

"Not for nothing have we a spy system here," Mart Toral reminded him. They were racing down narrow, cluttered streets. Packages, metal cans, great refuse bins stood along their sides, with barely room for passage of one of the six-wheeled trucks of the Seeset. Evidently an alley. Mart Toral showed wonderful familiarity with them; they traversed miles of tortuous narrow alleys, seldom crossing even a quiet side street. Only once they hastened across a broad, main boulevard, brightly lighted. Even then, it was leisurely haste. They were attracting no attention by running.

An hour later they began to see more and more hastening slaves about—homeward bound, Mart Toral explained. Their homes were tiny cubicles, representing their only hope of rest and peace for a few short hours. Thicker and thicker the streams became, yet none seemed to pay any attention to the strangely colored Terrestrians nor to the giant Jovian, his inadequate shorts bursting over his tremendously muscled thighs. They began to reach a better lighted district and here they approached a Seeset police patrol, two giant reptiles.

"Mart Toral," Aarn called softly. Swiftly he explained his plan. The Terrestrians and the Jovian dropped around a corner, and Mart Toral and Thor Mant went on slowly toward the Seeset patrol. They seemed to slink along, close to the wall. Cautiously they approached the reptilians, half-hidden in doorways at times. One of the wide-eyed Seeset saw them, and abruptly the two sank back out of sight. The Seeset said something to his companion, and started toward them. Hastily the Tornans started the other way. The Seeset called something sharply, but Mart Toral and Thor Mant only hastened the more; and as the Seeset broke into a swift, swinging gallop, they raced around the corner. The Seeset followed.

Two tremendously powerful hands caught the two reptiles, one hand on each of the hard-scaled necks. Aarn's fingers closed like living vises, and jerked with a swift sideward movement. He dropped back to the ground, and the two Seeset dropped beside him, to be caught in his arms and slid noiselessly to the ground—their necks broken.

"Ah—two more Sharls," exulted Aarn softly. He passed them to Mart Toral and Thor Mant as the two best adapted to use them. They started on. No more patrols were met before Mart Toral led them through a crowded doorway, and through a mass of squirming Tornan slaves who did not seem to notice them. Stupid, dull faces—and suddenly a mask slipped abruptly, then slipped back, and one of the dead-faced Tornans shuffled toward Mart Toral, then went on ahead, to a tiny cubicle on the fifth floor. There were two bunks here, a woman lying asleep on one of them. She woke at their entrance and sat up with her dull, stupid face annoyed. Again a mask slipped, the young woman's lips moved in glad surprise, then the mask was back in place.

Aarn started telepathic conversation. "No need to speak; we can speak by the mind. Mart Toral will speak to you, and I will know what is said; you need only think your thoughts for me."

"Who are you?" The woman's lips moved silently, her face expressionless, but a great astonishment in her mind as she took in Aarn's tremendous shoulders and back muscles. "You are no Tornan."

"I come from a distant, far larger world. Just now—from prison."

"The thing necessary now is coloring," Mart Toral snapped. "We must go to the Karatawn Tarnak. Their ship is probably there."

"Then," said the man, "these are the ones who arrived in the strange ship?"

"Aye—certainly. Haste."

The man moved hastily. From somewhere in his bunk he produced a tiny machine that suddenly started humming, and tiny sparks shot from its five-inch metal aerial. "It blocks the radiated sight apparatus of the Seeset. They will think it a normal breakdown. Investigation will show a blownout fuse. It will mean trouble for Karto here—but that is the service."

Aarn was busy. Karto had produced a complete series of liquid dyes in little rubbery flasks, and Aarn was rubbing one on his skin. The others were similarly busy. "They won't—have to wait—go with us, can't they?"

"If you can carry them?"

"I'm thinking of taking about half this city," answered Aarn grimly. "What is this stuff?"

"A dye we use in covering bruises and such. In case we attack Seesets, it is advisable that the attacker not be marked. Usually—" Karto shrugged, "we also dye some poor slaves that they may find an attacker. It keeps them mystified, and helps us sometimes. The slave—the mindless one—is killed, and one more Tornan is released from this hell." It was the only release, after the drug had been given.

Five minutes later, the party had split into two groups. Toral led one, which composed Aarn, Spence, Carlisle, and Thor Mant. The others came a little behind them.

The alarm was out now, and a close watch was being kept by the Seeset police, seeking the escaped men. But in a quarter of an hour, the great sheds of the Karatown Tarnak loomed dark against the cloudy sky. There were many bright lights here, the grounds were flooded with them. Mart Toral looked questioningly at Aarn.

"You said you could find some entrance."

"Oh—surely." Aarn grinned good-humoredly.

"They have powerful guns mounted over the door that would stop you the instant you entered the light."

"Who does the work here?"

"Ahh—Seesets—but they have slaves for the minor jobs. They are all numbered and checked photographically."

"Do they ever send messengers?"

"Seldom."

"How do they do it when they do?"

"The slave—a *single* slave—approaches, with his message cylinder held before him. Two guards come out and take it from him. He then retires at once. There must be no spying here, you see."

"Ah—surely. Get me something that looks like a message cylinder, and give me some of those dyes—"

Mart Toral asked no questions. He disappeared, and reappeared in some ten minutes, as the slow dawn was breaking, with a small metal cannister, painted bright green.

"That color means the message is of first importance, and from the military forces," he explained simply. "It was the only one my men could find anywhere."

"Excellent," said Aarn simply. He took a tube of bright red dye, and in an instant there was a long red gash down his right side. "What is the name of the military commandant of the city?"

"Sharblox," replied Mart Toral, after a consultation with Karto, "is the commandant of this day."

Aarn burst out of the side street where they had been crouched, the dim glow of the maroon-red dawn lighting his figure as he ran in a half stagger toward the door of the great shed, clutching his left side with one hand, waving the cannister in his other. He half fell, and rose to his feet again, staggering. Two Seeset appeared at the door suddenly, their sharls in hand, watching him. One hissed something sharply. Aarn only ran on. "Shar—Shar—blox—" He almost fell as they lowered their Sharls, and caught at him half a step from the open door.

That was their mistake. Aarn was crouched as they bent over him. His legs drove down, and his body up, like pistons in a great engine. His rising shoulders caught the unsuspecting Seeset in their midriffs, and all three hurtled through the still-opened door. With a crash the door shut behind them.

Aarn's fingers found their throats instantly, and their necks snapped like dried twigs.

Aarn leaped up—a sharl in each hand. Two more Seeset were advancing on him at their queer, swift gallop. The sharls in Aarn's hands burst into whispering flame, lambently glowing violet-red beams thirty feet long that dropped the Seeset, smoking noisomely. Aarn had seen the *Sunbeam,* Seeset engineers working at her still-closed inner-lock door. With leaps of twenty feet he raced toward her faster than Seeset guards could gather. A living tornado hurled the Seeset engineers from the ship in incredible time. Before the men within that section of the giant shipyard were aware of disturbance Aarn had slipped a key in the lock door, and flung it open. He was carried in with the rush of air, leaped up a short flight of stairs, and reached the control board. His fingers flew.

Transpon beams within the ship suddenly roared with life. A titanic scythe of white-hot destruction cut across the Karatawn Tarnak as the giant aggie coils poured out their energy along a great transpon beam that released the stored energy of a star in a beam ten feet across. Incandescent wreckage remained where it cut its swath. It swung from a horizontal plane, and cut abruptly through the roof.

And died, as the ship jumped instantaneously a hundred feet up, two hundred across, and a hundred down. Eight men were racing for the still open lock.

"Shut the door after you, Martin," called Aarn cheerfully. He had been gone from them not thirty seconds, yet now Karatawn Tarnak was half molten, incandescent wreckage.

"The battle cruisers will be here in thirty seconds. Flee!" advised Mart Toral.

"Not yet a while," Aarn replied grimly. The *Sunbeam* rose. From her poured three beams of incandescent destruction; from three ports Shal torpedoes started horrifically at the very heart of Karatawn, and as Carlisle discharged these, Spencer was at work with the bombs. Great rushing spheres of crystallized blue light —ball lightning discharges designed to destroy great battle-

cruisers of space, lambent red dumb-bells of magnetic force that could twist four-foot steel armor to shreds. Karatawn Tarnak lay a ruin, with a few odd lumps where great battleships and cruisers had been. Nothing lived there.

And in the heart of Karatawn great buildings were shrieking in terrible ultra-sonic vibrations, their walls crumbling to dust, the dust transmitting the shrieking destruction to adjacent buildings, and their crumbling frames sending it to the bed-rock below. The Shal torpedoes were exploding, grain by grain, in a fury of ultra-sound that killed anything which felt its vibrations, and could grind its way through the armoured walls of a giant battleship.

Then six great cruisers swooped down in a screaming rush from somewhere beyond, and started for the *Sunbeam.*

"Ah—" sighed Aarn, happily, "get back a little of our own on somebody our size, maybe—" A titanic violet-red flame, a monster sharl flame, swept hissing toward them—and around them harmlessly. "Electric-ions," Aarn mumbled. The nose of one of the cruisers exploded into incandescence as a terrific transpon beam, loaded with thousands of volts and as many tens of millions of amperes hit it. The nose of the ship went up in a thirty foot flame.

"Oxygen in the air—" Aarn shifted to another ship, and the first burned white for ten seconds more before glowing out through red to black. In the meantime Spencer had found it with a magnetic bomb, and its frame was warped and twisted. Another of the six was bathed in a continuous electric fire as three ball lightning bombs in succession hit it.

A third glowed luridly inside, and fell with a splintering crash to the ground as a gravity-field bomb released its millions of kilowatt hours in its heart. Those still capable of fleeing, fled.

Something else was coming. A dark shape that loomed three-quarters of a mile long, and a quarter of a mile in diameter. Something black as space, an incredible giant of a ship. A thing half the size of the *Sunbeam* darted from its side, flames shrieking

from its tail. It rushed at them—and exploded with a concussion that hurled the *Sunbeam* three miles from the city, unharmed.

"That," said Aarn, "is a bomb to be noted with care. They are to be avoided. That battleship is a first-class ship of the line!"

The *Sunbeam* started for empty space—and suddenly stopped in midcourse. The meters on the board before him jumped over to twenty times their former readings, and the ship came to a momentary halt, then plowed on, everything in it glowing with a faint blue light, the very air glowing, a strange whistling rustle that murmured and mumbled like some half-heard hag in their ears. The reflected light from straining, glowing transpon beams came to the pilot room—but there was no sound, and Aarn's sudden shout was soundless as space.

The *Sunbeam* swung about, and her three transpon beams united on a single objective—the nose of the titanic giant rushing down on her. The nose of the ship flared incandescent, grew brighter still as Spencer added half a dozen magnetic bombs. A lurid glare within told of the flood of gravity bombs, releasing their stored energy, seeking her gravitational center. But the ship did not falter. The *Sunbeam* was suddenly pushed by giant hands as her magnetic atmosphere felt the thrust of the monstrous battleship, and her momentum wave drive bit into it. Aarn paled slightly, and pushed a stud before him to the extreme limit of its run. The *Sunbeam* was suddenly bathed in lambent blue flame that came and went soundlessly, and reached out to lap about the mighty nose of the giant ship. Vast flecks of white-hot flame appeared as the various forms of material destruction spent themselves on the protecting sheath of magnetic force. The *Sunbeam* trembled violently — and then she was pulling slowly away, as though forcing a path through thick, viscous tar. And behind her, a great black cap, the nose of the Seeset battleship, separated from the ship and came with her, riven by the struggling momentum waves. With an accelerating rush, the *Sunbeam* swooped away, her power at last greater than that of the beam that had caught her. The ship dwindled like a pricked balloon, and the

entire planet of Darak was suddenly a dwindling ball in space as Aarn pushed back his control stud.

"Sweet Swinging Satellites! My pardon to you reptiles. THAT was a BATTLESHIP! I don't care for any further close range observation. Mart Toral, what was that soundlessness? Whatever it was it drank out power faster than my transpon destructive beams. It took two thirds of our power in five and a half seconds!"

Mart Toral was somewhat greenish in color. He was almost physically sick. "Death," he answered briefly, sighing. "I never before, none of us ever before, pulled free of that beam. Battleships—our greatest battleships, can resist it and pull out, but if the beam catches them while they are moving rapidly, the result is instant death to every man aboard them. The ship stops—and the men and small machines inside don't."

"Uhm hmm—they would and they wouldn't. I think I know what it is." Aarn examined his instruments intently.

"Well, what?" Spencer demanded. "The Tefflans never gave us anything like that. That soundlessness and that queer whispering was ghastly."

"It was anti-momentum. These fellows have gotten on the track of the momentum waves, but gotten on the wrong track. It's like a very coarse net. The ship is caught in the meshes, but the men aren't. The result is obvious. Our momentum drive fought it, naturally, and prevented anything of the sort happening, but it certainly fought back, hard. The automatic adjustments kept us from losing much momentum before I had a chance to take a hand, but they had a tough job! Then when I put on full power, and we pulled free, we shot away with an acceleration of about a million gravities. We went through the atmosphere so fast, there wasn't time for us to heat up."

"You will take us to Cornal—our planet?" asked Mart Toral.

"Certainly. Your help was invaluable. I could do no less—and besides, I hope we can be of further mutual aid. Evidently you don't have the momentum drive on your ships, nor any

weapons of power equal to the *Sunbeam's,* since you didn't expect her to live through the attack of those cruisers. We need information, and need it badly. Can we affect an exchange?"

"If it is within our power, we would gladly exchange any information we might have for the secrets of this ship," replied Mart Toral eagerly.

"I'm lost and I want to go home. But I don't know where my home star is, as I said. The problem is, how to find it? The only way is to make use of star-catalogue plates. We have plates taken from our home planet, and what we need now is a complete star catalogue showing the external galaxies taken from your planet."

A puzzled mass of thought churned in Mart Toral's mind. "What does that last mean? I cannot understand it."

"Ohh—," Aarn looked at Spencer in dire distress. "He doesn't know what an external galaxy is. That means they haven't got telescopes big enough to handle the load!

"An external galaxy," he went on, turning again to Mart Toral, "is a compact group of stars similar to the great group of which this sun is a member. Do you know anything about that—would your astronomers?"

Mart Toral suddenly looked at Aarn with dawning understanding.

"Ghthp kessiigg!" he exclaimed, giving vent to some perfectly un-translitterable grunts and hisses. "The Seeset know about them, and have excellent pictures of them. We know so much from the spy-slaves in the colleges. The Seeset have an enormous advantage over us. Our cities are underground. We can have no surface works, and we have no satellite, while Darak has two. On the larger of these satellites, they have established a wonderfully fine observatory. We have, of course, small observatory ships, but the astronomers say that they are practically useless for important astronomical work of certain types."

"They would be," agreed Aarn.

"We have done no long-range work. Besides, naturally, our interest has been too completely held by the reactions of Torka.

When your own sun may blow up any time, you lose interest in distant stars you can't reach."

"Hmm—that's a thought. Then you do know all about the instability of your sun?"

"Know about it! That's the cause of this war," exploded the Tornan. "We were friends, the Seeset and Tornan nations, until the Seeset suddenly discovered about one hundred years ago that the fluctuations of Torka were leading to ruin. Then they discovered that their planet was going to be almost wiped out, for Darak will become red hot. Cornal will be terrifically hot, unendurable on the surface, but it will be possible to maintain life in insulated, cooled cities under the surface. These will be possible only in certain localities, because of geological factors. The seas will boil off, and when they do, the lightening of the load over their beds, and the increase in pressure over the land now dry will cause terrific quakes. Only certain localities will be safe even for cities underground. There won't be room for both races. The Seeset realize this, so they have decided, quite naturally, that ours is the one to perish. Their original plan was that a sudden and violent attack would wipe out most of our race, completely de-civilize us, and make us prey for them. We were to be slaves—thanks to their drug which would make us mindless beasts of burden—and dig their cities.

"They, you see, were the ones who had developed space travel, and had kept the secret of the atomic engine. We don't know it yet. The original commercial competition between rocket ships and their atomic-drive ships was hopeless, and they had all the space ships. So they came over in their twenty-two great passenger and freight liners, and started the war. They destroyed twenty-two major cities and a hundred million Tornans before we could begin to resist. We knew where their ships would go next—and prepared. You see, their weapons were then just bombs—explosive and fire bombs. They did use gas to a small extent, but mainly they dropped tons of sodium bombs, which set fire to our cities, and burned unextinguishably. They burned to sodium peroxide which was as bad as the original sodium, and

started more fires itself. The fires were their weapon, really, for even twenty-two giant passenger and freight liners can't carry enough destruction to wipe out a world of cities. The fires spread, though, and killed and destroyed.

"When they went on to the next group of cities, things were different. In those days there was no Tornan Confederation. There were hundreds of big and little political divisions of no significance whatever. But each thought its own entity of the utmost importance, and considered itself very different from each of the others—till the Seeset began dropping fire bombs and destruction. Then they suddenly discovered they were all Tornans—particularly the small nations. The result was an overnight unionization. Since each nation, big and little, had had its own army and navy and weapons, the big nations now sent all their weapons to the places they believed would next be attacked, and waited.

"The Seeset ships came. They were attacking the centers of population and civilization in rapid succession, and in order of importance. We had defended thirty-one cities. The Seeset ships dropped down to release their bombs, and they were allowed to release them in some cities, since all the ships had to be destroyed at the same moment. Then, when all ships were within range, the guns were fired. They had been very carefully laid, and they shot tremendously powerful projectiles thick as my body. The Seeset ships were passenger ships, and carried no thick armour, consequently every one of them was blasted with highly explosive shells, gas shells, phosphorus shells, and every other type of destructive shell we could invent and launch. The twenty-two ships fell within fifteen seconds, and Tornan troops had entered and destroyed the Seeset inside in almost no time.

"That was the first notice we got of the slave situation. They had Tornan slaves on board, and every one of them was a witless dumb animal.

"Since then—" Mart Toral shrugged expressively, "War!"

"You have been forced underground, and the Seeset have not?"

"It is not solely a question of forcing. We intended to go underground; but the Seeset know their world must be destroyed, so they aren't interested in underground cities on their planet. Ours were to have a later use. Then too, for a long, long time it was all we could do to keep our position on our planet at all. It was years before we had an effective space-navy. The accumulator, our only effective means of getting power in space, is a more or less recent invention. The Seeset had been using atomic engines to power their weapons, and when we first used accumulator powered ships we slaughtered them in large numbers, because for the short period of the battle, our accumulators allowed us far more power than their engines yielded. But they soon stole the accumulator idea, of course, and proceeded to combine it with their driving engines." Mart Toral paused thoughtfully. "If you wait with us for a few days you will see a space battle, probably."

"What? Do you hold battles by mutual agreement and treaty?" asked Aarn.

"No," Mart Toral smiled. "Not quite. It is just that the Seeset, having been badly stung by this ship, will certainly make every effort to destroy it, and if not it, the Tornan navy, before it can do them any damage by passing on the secrets of those weapons to larger and even more powerful ships. They know that you escaped with a group of Tornans, and headed for Cornal. The Seeset won't like that. They will certainly attack."

"That," decided Aarn after a moment's thought, "is certainly an idea to be considered. I suggest we go to your home planet as quickly as possible, and tell the folks about it. I have some useful things they might want to install before then."

"Yes, no doubt," Spencer agreed, "but they can't. It takes time, and as the Seeset are attacking to prevent that very thing, the time won't be had."

"There's no use lingering. That's Cornal, isn't it?" asked Aarn, pointing toward the fourth planet of the system, toward which he had directed the *Sunbeam*.

"Yes. How long will it take to reach it?" asked Mart Toral.

Aarn turned to look at him, and a slow grin spread over his face. "Now you don't see it—" he flipped a switch, space darkening strangely for a moment— "and now you do." He flipped the switch back. Cornal loomed gigantic directly before them. Under her maximum acceleration, the *Sunbeam* had covered the distance in minutes. Less than 100,000 miles away, it was a world of land with great land-locked seas in contrast to Earth's water-locked land. Mart Toral stared.

"By Harum, we came here at speed! But—"

Without warning the *Sunbeam* rocked slightly as a series of brilliant daubs of fire washed over her. Simultaneously a strange shrill whistling sounded through the ship, and Aarn instantly threw the ship back several hundred miles. "Crumbler ray—say, Mart Toral is that one of your ships?"

"Yes, the patrol I started to tell you about. He naturally attacked when you appeared. Did he do any damage?"

"No, it was set for steel crystals, and this ship isn't made out of steel. But you can generate that ray?"

"Yes, our scientists invented it. But the Seeset stole it," Mart Toral sadly replied.

"Hmm—what did you steal in return?" Aarn grinned.

"Their drive discs." Mart Toral laughed. "It's about even, I guess. But my friends out there are trying to get at you again. What will you do? Have you a monochromatic light projector?"

"No. Never needed one. That your signal device?"

"Yes, a special combination of colors. What shall we do?"

Aarn thought for some seconds. "I think I could open him up and turn him inside out, but that's not the way to make friends. But—" Aarn set to work with the transpon beam controls just the same. For some seconds he maneuvered skillfully, and watched his instruments. Then with a grin he made several major adjustments. "Here's the answer," he chuckled, "I'm going to pull his power!"

Transpons roared suddenly, violently in the *Sunbeam;* invisible beams reached across space, tapping the power stored in the patrol cruiser's great accumulator banks. For twenty seconds

the beams roared, then slowly died to a whisper, then silence. The cruiser hung some fifty miles away, motionless now, and only a dim, reddish glow spotted the few ports. The guns were working hard, but the *Sunbeam* maneuvered toward her calmly. A rattle and crackle came from the loudspeaker as Aarn connected the radio. Rapidly he turned over the wavelengths, till intelligible voice came from it, and Mart Toral brightened and grinned.

"They're calling all battleships, with warnings to look out that we don't drain their power too. He's awfully angry. He's saying things that don't belong in official communications. He's running on his chemical batteries—the only power he had on board. You seem to have cleaned him out."

"Talk into his microphone," smiled Aarn. "He probably has his receiver on the same wavelength."

Mart Toral began speaking. "Cruiser *Harun Tarl,* Cruiser *Harun Tarl.* Speaking from aboard the ship *Soon-baym.* Mart Toral, C-584, speaking. We had to drain your power to prevent your damaging us. Mart Toral, and friends. Refer to your code. R-G-H, T-P-B, Q-D-K. Was effected by these men from a planet of a different system. This situation not covered by code. B-K-L is nearest." Mart Toral turned in a hasty aside to the Solarians. "He doesn't believe us, I'm afraid."

"I was afraid he might be reluctant to believe it," nodded Aarn. "The battleship commander will investigate first and fight afterward though, won't he?" Aarn asked. "My storage coils are about half full now, and I'm not sure I could hold all the power a battleship would carry."

CHAPTER THREE

THE PATROL ARRANGEMENTS OF the Tornans were efficient. The battleship arrived within a quarter of an hour, carrying on a long-distance conversation with Mart Toral all the way that finally convinced her commander that the *Sunbeam* was a friendly ship. The cruiser commander was still unconvinced. He was also very angry. His ship was, naturally enough, his pet, and when a strange, and much smaller ship came up, and proceeded to drink out every bit of her stored power in some unknown way, he was not inclined to make friends with that stranger. At length, however, he was pacified, and when Aarn sent a pair of transpon beams loaded with power onto two contact-cables thrown out of the cruiser, and re-charged the cruiser's accumulators, he felt better. Considerable damage had been done, however, to some of the more delicate high-voltage apparatus aboard the ship, and his men were kept busy repairing this as the *Sunbeam* went off in the wake of the great battleship.

"How did you do that, Aarn?" asked Carlisle, "and why haven't you done it before?"

"It's simple enough. I used the transpon beams as they were meant to be used—to pick up power. They drained all the electrical energy out of the ship, and as his accumulators are just super-condensers the result is obvious."

"Why haven't you used it as a weapon before this?"

"One shot, won't carry far, nor hard. As a weapon it's useless, practically, because if there had been any really high

voltage—around say fifty thousand—the insulation on my transpon apparatus would have broken down. I sent over a very, very light test beam first, and found there wasn't anything hotter than ten thousand on the ship and since I could handle that, I just sent along a heavy beam."

"That being settled," suggested Spencer, "let's settle the future course of events."

"That's easy," Aarn replied. "These Tornans are interesting—the Seeset have plates that are just what we need—and I'm sick of looking all over space for planets. We've found some, so let's thank the kind Lord, and go get what we want. These fellows can help us, and we can help them. Mutually satisfactory."

"Also," said Spencer with exaggerated innocence, "they have the secret of the crumbling ray, which the Tefflans used against us, and you never learned how to make."

"Quite right, my dear Spence, quite right," Aarn grinned. "You couldn't ask me to forego a bet like that. And besides, these fellows must have some more things of interest. Science is to be studied anywhere."

"If we land, we fight with them," Spencer pointed out.

"If you don't want to land, we can make you a boat and you can go search space for planets yourself," Aarn laughed. "You know darned well you want to."

"That being settled, the question arises: Do we give them the speed drive?" asked Spencer.

"I've been thinking about that," admitted Aarn more seriously, "and while that is a real help in many ways in war, I'm afraid they'll have to forego it. One secret we'll keep. This planet is hard-pressed, they need worlds that aren't near a sun about to blow up. I couldn't blame them in the least for wanting to follow us home and using some of our spare planets. So we'll just omit to explain the speed-drive."

"They will see the apparatus, though."

"Certainly. They have science, and good science—but it just doesn't happen to be along that line. They haven't had any experience with that fifth dimensional inter-space, so the best of

them couldn't learn anything even if they took the speed-drive apart and put it together."

"You'll give them everything else?"

"Certainly—they're apparently a mighty fine, human race. But they just naturally have to have a cooler home, and I don't believe in putting temptation in their way."

The battleship had entered the atmosphere of Cornal, and the *Sunbeam* followed. Mart Toral and his companions had transferred temporarily to the battleship, but now, as the two ships sank to a low level, he signaled he wanted to transfer back and swiftly Carlisle made a series of simple tests on the atmosphere, found it to be entirely satisfactory, and let them in the lock.

"If you will," said Mart Toral, "we would like you to accompany us to our main naval base at Sarna Tarn. The United Council is based there, and the High Command. They naturally wish to speak with you, and learn what treaties we can arrange."

"Good enough. We'll be right along," agreed Aarn. For telepathy had a number of advantages over speech. One was that the sender sent not merely his words, but his ideas. If he wanted to say "arrange a treaty" and thought, in his mind, "arrange a capture" the latter came through also. Mart Toral and the Tornans were friendly.

The entrance to Sarna Tarn was a great pit blasted in the solid, ancient rock. This was one of the sites picked as geologically sound, safe even through the quakes that would beset Cornal as the seas evaporated and the land readjusted itself. The pit angled down to a depth of nearly half a mile. Wooded plains above, hard, age-old rock beneath, and the city buried deep within it. To one side there was a vast clearing, and paving it, dark metallic things that glistened in the bright moonlight.

"Your power source?" asked Aarn as the *Sunbeam* followed her giant guide into the third-of-a-mile-wide hollow.

"Photocells that generate power from sunlight. That field is unusually large—the greatest on Cornal. It has the duty of

filling the accumulators of the ships based here as well as the heavy job of running the great machines."

"I will show you a better power source—the sun itself. It will take but a few weeks to set it up, and the power question, which I suspect is a large one, will be settled."

They had entered Sarna Tarn. The city was divided into six main caverns, each a great manufacturing base. In one, battleships were housed and worked on, in another cruisers, in a third destroyers, and in a fourth, smaller ships. The other two were devoted to manufacturing standard equipment, such as accumulators, and instruments, and to the reduction and production of steel. The *Sunbeam* lay in a destroyer's berth.

Mart Toral, accompanied by Aarn and Spencer, went to the United Council's meeting room. A moving walk carried them from the destroyer cavern through a long, brightly-lighted tunnel to a seventh separate cavern. This was the residential, the executive section. There were no ships here, only the moving walks, and elevators. Trees and shrubs grew in soil brought from above. The buildings were carved from the living rock, some apartments built in the wall of the city, some separate houses entirely free in their own grounds. Here and there tremendous pillars of solid rock reached up to the low rock ceiling less than two hundred feet above, pillars so huge that they practically divided the section into many smaller compartments. The Building of Controls was in the heart of this section.

"There will be a large number of people present," explained Mart Toral, "mostly commanders and higher officers of the fighting ships. Jan Reys, the Commander in Action of the battle fleet, commander of the Flagship of our line, will be present."

"Hmm—all the dignitaries. You represent the head of the Enemy Information system, do you not?"

"Nnnnno — not quite. My forces — and all government groups—are subject to the High Command, which is made up of one high military official, one scientist and one production executive. The military forces were found to be badly out of balance, demanding impossible things of the production facilities,

and not fully awake to the need of science. Hence this board of control."

"I wonder," asked Aarn keenly, "if there wasn't something very special that called you to Darak. You are evidently an organizer rather than a mere expert gatherer of information."

Mart Toral smiled grimly. "Quite right. My force had learned that a new development of the Seeset science existed. They couldn't find out what it was, so I tried. You found me in prison," he concluded with a shrug. "I failed."

A stream of uniformed officers was hurrying through the building toward the great auditorium as Aarn and his guide made their way along. There was an air of tense hurry about them; they were coming in answer to a sudden emergency call, and emergency calls usually meant trouble in large doses to these men. Mart Toral led the Solarians through a smaller side door, and they found themselves on the platform of the hall. A group of fifteen Tornans was already seated at a large table, and now Mart Toral led them to it. A hush fell over the audience, and Mart Toral spoke.

"Lords: These are those men of whom I have spoken. They are men of another system, another sun. They landed by chance on Darak, were immediately captured, and taken to the Karatawn prison, where I had been jailed waiting investigation."

Rapidly he gave a clear, concise account of all that had happened during their escape. He followed this with a more or less technical description of the weapons Aarn had used, in so far as their effects were concerned. Then finally Jan Reys rose.

"Your report," he began, "has been brief, but full, Mart Toral. One of my men, Tarno Par, commander of the battle-cruiser *Harn Tarl,* has a report to make."

A television screen lighted, and the commander of the cruiser patrol which had met the *Sunbeam* appeared on it. Rapidly he told what had happened to him.

The Commander in Action rose again. "I think the High Command will agree with me that, after such severe treatment by this ship, the Seeset will want to attack immediately to prevent

our ships being equipped with her all too deadly weapons." The men about the table nodded. "It is certain," they muttered.

"Mart Toral, what news did you gather of the new discovery of the Seeset?"

"We know little more than before. For the benefit of the assembled Ship-Commanders, I will say that the Seeset definitely are known to have developed a new weapon, or weapon possibility. It is a mirror of pure force that will reflect any of the ordinary electro-magnetic radiation between the infra-heat and the ultra-violet. That was hard to learn. It was impossible to learn how this was to be done."

Aarn gave a little whistle of surprise, and Mart Toral turned to him. "You know something of this?"

"Only one thing, Mart Toral, and it is not helpful. I have always said that a beam destructive by application of sheer energy was impossible because it would be more destructive at the sending than at the receiving end. I withdraw that. With this I could make a destructive energy-beam."

"How?" Mart Toral and the High Commander of Science asked simultaneously.

"By putting in front of such a parabolic mirror of force some type of intense heat center. The obvious answer is an arc of hitherto unattained intensity. Since the beam is to have an energy concentration nothing solid can withstand, the arc must be between non-solid terminals. I would suggest two streams of ions shot in to meet at the center of the mirror. The solid ion-projectors would be out of the way, and if the ions are very heavily charged, the reaction could be intense beyond belief."

"I would report," snapped Mart Toral, "that one of our men in the Tarkass University of Darak has reported the production of quintuply ionized nitrogen. I considered it of only the most minor importance."

"I think that is how it would be done. The nitrogen ions, carrying a tremendous charge, would be shot in to meet a stream or several streams—of electrons. A flame of incredible intensity would result. It would be largely in the far ultra-violet, of course,

but the energy concentration thus made available would certainly be sufficient to make an exceedingly dangerous destructive heat ray. Further, since most of the energy is in the ultra-violet, it would be practically impossible to reflect it, as would be the case with visible or infra-visible radiation."

"Have they," asked Jan Reys, "equipped any ships with the new apparatus?"

"They have been working frantically to do that," Mart Toral replied. "But they have equipped only two ships completely, and two more are in the shops for equipment. The apparatus was known to consume such tremendous power that great alterations were needed in the structure of the ships."

"Would they delay to finish the equipment on those other two ships?" Jan Reys asked.

"By no means. That will require another two weeks. They will attack with the two already equipped."

"How long," asked Aarn, "will it take them to make the trip to within five million miles of this planet?"

"Three days. They will require two days for mobilization as will we. This will be a long and bitter battle. A decisive battle if the Seeset can possibly make it so."

Hours of discussion followed, the military, scientific and production questions all being considered. Gradually Spencer and Aarn began to see a clearer and better picture of Tornan affairs. Machines had been developed to the ultimate here. Where war had been continued for generation after generation, machines were the necessary item. They were far ahead of production machines of Earth. "With these machines, they might turn out some transpon apparatus, don't you believe, Aarn?" asked Spencer at length.

"In two days? Certainly—a copy that would be more apt to backfire than to fire. The machines are all right, but the men who direct them aren't. They haven't the training. The time is too short. No, they'll have to fight as they are. We'll help, and that's all we can do."

CHAPTER FOUR

AARN MUNRO TURNED AWAY from the controls of the *Sunbeam* and faced Carlisle.

"No," he said, "they have no detector apparatus. Just plain eye-sight. That's their main reason for having their observatory ships. They have them out all the time, and no fleet can leave the planet down there without the observers spotting it."

"A ship's a pretty small thing, at that distance," objected Carlisle. "Suppose they miss it."

"They won't—because the telescopes are specially designed for that work. They can spot even a destroyer, let alone a half-mile long battleship. Besides, they generally know about when a battle is going to be started. Remember, a mobilization for a general battle means the movement of nearly a million men. The Tornans and the Seeset each have about seventy battleships, one hundred cruisers, and five hundred destroyers. Then whole fleets of little one-two-three and ten man scouts. Nearly five thousand of them. A battleship requires a crew of three thousand men, a cruiser some fifteen hundred, and a destroyer about five hundred men. That means that when all the ships are in use, which of course seldom happens, some always being laid up for repairs and alterations, a total of nearly six hundred and thirty thousand are in the ships, and more men are needed for ground crews, and for service ships. When the battlefleet moves, naturally there are a lot of unarmed and unarmored service vessels, accumulator ships for the scouts, and destroyers, repair and mother ships. The total of men actually in service is near seven hundred thousand

when the Tornan fleet rises. The same is true of the Seeset fleet. When a mass of men as great as that must be moved, there are, naturally, complications that can't be kept secret from the spies. Hence the forewarning of the battle."

Aarn swept his arm toward the windows and the star studded space beyond. But space was studded with something besides stars. Directly in front of them, and not very far away was a disc made up of several hundreds of scout ships, and several score destroyers. And much further was another disc of scouts and destroyers—Seeset ships.

"Why not go forward and try discouraging those smaller ships? It would rather upset the morale of the Seeset," suggested Spencer.

"We might at that," nodded Aarn. "I think we have more than enough stored power."

"Why don't the cruisers do it?" asked Carlisle.

"For the same reason elephants don't step on flies. They'd be able to kill them—if they could get their foot on them. These cruisers aren't built for lightning maneuvers. You can't whip two foot armor around the way you can a four-inch plated scout. But we, on the other hand—"

The *Sunbeam* flashed forward under something like thirty thousand gravities; in one second she reached a speed of 175 miles per second, in two her speed had reached three hundred and fifty. Aarn cut speed almost instantly, but by that time he was in the midst of the destroyer screen of the Seeset fleet. The destroyer captains were probably vastly surprised. Momentarily. The *Sunbeam's* three transpon beam projectors were working at full capacity, which meant, when they struck a destroyer's thin plates, like so many white-hot knives. The nearest destroyers were neatly and precisely sectioned. Not being designed like the heavy battleships to resist any possible calamity, this meant that most of them were put out of action before they could act. Some men lived in them to fire their guns, harmlessly. In thirty seconds of rapid work, Aarn destroyed twenty-five destroyers. By that time the destroyers were decelerating at their very respectable

maximum, and the battleships were accelerating at their very respectable maximum. Aarn hurtled the *Sunbeam* back to her former position with alacrity. Wisdom overweighed valor when ten or a dozen giant battleships came in range.

In about half an hour the brief, fierce skirmish of the two minor fleets, the scouts, had taken place, and was over. The Tornans had won, thanks to Aarn's ferocious attack on the Seeset fleet, and the Tornan scouts hung in a cloud about the battlespace now, watching every move of every ship, reporting in a constant stream every possible development that might have a hidden meaning.

The cruisers came into action, fought briefly and stubbornly, and made way. Their duty was to finish off the sectioned battleships.

They retired as the behemoths, the super dreadnoughts lumbered majestically into action. The *Sunbeam* waited. She was nearly 100,000 miles from the scene of the battle now, observing with the utmost care—and undisturbed. The fleets were evenly matched; some fifty giant ships formed each disc, or more accurately, hemisphere. But Aarn noticed at once that the Seeset were favoring two of their craft, two ships apparently in perfect condition, and major ships at that. Mart Toral, serving with them as liaison officer now, looked carefully through the telescope at these two.

"Seegh-type ships. Their newest and best. They have only two equipped with the new apparatus. Those must be the two."

"They're waiting, I'll bet, to see whether or not your ships have any special equipment—anything new," Aarn said judiciously.

"Probably."

The battle had begun. Gigantic spurts of flame appeared along the walls of each of the ships, great shells specially designed and equipped to penetrate the repulsing field of the space-discs that would hold off meteors. Deadly mud-torpedoes, a heavy explosive torpedo equipped with a slow-acting fuse, and a tail loaded with half a ton or so of a liquid, sticky mud that, when

the nose of the torpedo struck, would flow down over the rest and give the explosive something besides empty space to push on. And crumbler rays, high-frequency electric oscillations which set the crystals of a metal, the fundamental structures of any solid, to vibrating in a torturing shriek that crumbled it away provided they weren't counteracted. But these were.

Spencer moved restlessly in his seat. "Aren't we going to do anything at all?" he demanded.

Aarn smiled faintly. "We are doing something. We're waiting. We're waiting just as long, and a little longer, than those new ships of the Seeset."

Mart Toral was moving restlessly also. Suddenly a Tornan battleship glowed faintly blue over all its length. Mart Toral stiffened, and Aarn worked rapidly on his instruments. For seconds the battleship glowed, till suddenly, on a near-by Seeset battleship a greater gout of light appeared, and abruptly the blue glow disappeared. "They hit his projector," said Mart Toral tensely. "Even those beams can't stop the mass of a battleship abruptly. But many men were killed, for not all of the crew can remain strapped in safety springs."

Nearly half an hour passed. One Tornan battleship had finally been reached by one of those tremendous torpedoes, half the size of the *Sunbeam,* and a great hole ripped in her side. Heavy shells had streamed in the broken armour, had blown that section of the ship to powder. But the damage was confined by the four-foot armor steel bulkheads. The rest of the ship was fighting as hotly as ever. A series of smaller torpedoes finally succeeded in cutting the ship in two, and now, with her maneuverability vastly decreased, the two halves attached themselves to near-by battleships. Each bulkhead was equipped with gigantic magnets, and these were holding the wounded sections tight against a friendly ship. They reminded Aarn of a hermit-crab, backed into the shell of some other creature to protect his tender hind quarters, his vicious claws waving threateningly before him.

The Seeset were satisfied. The two ships suddenly began to move forward.

A path opened through the hemisphere, and the two ships moved up, right to the grinding edges where the close, hot action was taking place. Instantly, as they neared, all the Tornan ships concentrated their spare fire on those two ships.

Aarn, far off, grunted and pointed at his instruments. "They've got that, too. Magnetic atmosphere," he exclaimed to Mart Toral. "It will stop anything material you send if it has a crystal of metal in it. Tell them to make some mud-torpedoes out of wood, and use synthetic plastics or fiber to make the detonator parts."

Mart Toral began to mutter into his microphone. He had scarcely begun, when the two ships went into violent action. With a start of pain, the Solarians turned away from their screens. One hundred thousand miles away the destructive heat beams of the Seeset had been turned on. Some of the radiation was reflected by the nose of the attacked ship, and even here that radiation was so intolerably fierce that for seconds the Solarians were blinded. Aarn was first to recover. When they looked out of the window again, they looked through protecting screens that cut down the fierce glow.

Two Tornan ships were being attacked, their noses now spluttering in the fiercest blue-white heat, slow explosions of gas puffing out. Suddenly, from one, a great plume of brilliant flame seemed to arch out, spreading swiftly. "Punctured," muttered Aarn. "And that's ten foot armour there on his nose." The flame died down swiftly as the last of the air in that compartment escaped. In a few seconds it arched out again. Another bulkhead had fallen. Aarn moved gently in his seat, and suddenly the battle front was swelling, growing toward them at immense speed.

"Don't!" protested Mart Toral sharply. "Your thin walls would vanish in a fraction of a second!"

Aarn smiled, and changed his acceleration to a deceleration, the distance half covered.

"We will not rely on them," he smiled. The *Sunbeam,* still moving at the rate of hundreds of miles a second, flashed through

the outer line of the battle front, and was suddenly in the center, near one of the giant new ships. Abruptly, space became utterly black, and only television screens remained to show the battle outside. The Seeset ship, it's beam visible even in space now, due to the air it had let out of the punctured ship, was still boring away at the wildly twisting Tornan. It seemed indifferent to the approach of the *Sunbeam.*

Aarn began operations. All three of his great transpon beams reached out, and simultaneously the transpons within the ship exploded the air from their paths as they hurled some fifty billion horsepower each at the Seeset ship. In a fraction of a second the great steel nose was glowing, then burning fiercely. The incandescent spot shifted, and settled fiercely on the ultra-violet beam projector. Simultaneously, Spencer showered the white-hot armor with his dully-glowing dumb-bell shaped magnetic bombs that tore and twisted great masses of metal out of its seat, and exploded in terrific energy releases. Carlisle's thermite bombs, thermite wrapped in thick graphite that alone could resist its blue-white fury, were burning holes in the armour, and Shal torpedoes, made of synthetic plastic, screamed in ultra-sonic fury that disintegrated the metal before them.

The Seeset finally turned his attention to the *Sunbeam.* Momentarily he couldn't find it, for the Solarian's ship was invisible. Then his instruments showed him where it was, and his two great beams swung toward it. The air in the *Sunbeam* glowed bluish, and a curiously horrible muttering set up within it as the anti-momentum beam fought her momentum wave drive. Then the ultra-violet beam struck them—and passed harmlessly through. The *Sunbeam* was surrounded with a sheath of that curious field Aarn had developed to permit close approach to a sun, a field that converted electro-magnetic radiation to gravito-magnetic that passed unhindered through matter.

For perhaps seven seconds the furious beams fought at the projector of the Seeset battleship, buried within thick metal that could resist by sheer mass. Then abruptly a colossal explosion of energy ripped the Seeset's nose open, left it gaping. The transpon

beams drilled swiftly on, through bulkhead after bulkhead in seconds.

Aarn moved swiftly, as the last of Spencer's magnetic bombs twisted the forward engineroom of the Seeset ship to scrap metal. The second beam-equipped Seeset ship was before them, its beams on the *Sunbeam*, and every possible means of material and radiated destruction turned against it. Again that whispering, shuddering blue-lighted soundlessness. And Aarn's transpons were boring at the ultra-violet projector as it turned uselessly toward him. Spencer methodically ripped away at the Seeset's projector with magnetic bombs; sent out gravity bombs that exploded in roaring energy in the very heart of the great ship.

The air of the *Sunbeam* was suddenly choked with a grating mutter, the blue light became streaming fire escaping from every pointed object on board, and the transpons behind cast a fearful glare into the pilot room. Aarn looked grim, and changed one of his transpon beams, testing with his instruments. Then suddenly it roared again—and the rapidly falling charge meters on the board ran swiftly in the reverse direction. A great Seeset battleship began to fade from view as her lights died; the straining momentum drive seemed to ease up; the grating sound in the air vanished. Aarn had stolen the attacking ship's power. But now another, and another anti-momentum wave beam came from near-by battleships, and the *Sunbeam* seemed to drag. For the first time they felt the accelerations they were enduring. Their drive was being overcome. Aarn shifted his pick-up transpon to another ship, and the strain eased momentarily.

A terrific explosion told him his transpons had finally drilled through to the Seeset's ultra-violet projector. The *Sunbeam* was struggling through something thick, and viscous, attempting to escape from this hell of battle. Anti-momentum beams were rapidly fixing on her from all about as the Seeset sought vengeance. Aarn's three transpons were very busy, picking power from one after another of the battleships.

For perhaps a full second the *Sunbeam* was comparatively free of the anti-momentum beams. Instantly the terrific power of

her own drive hurled her out of the danger area. Mart Toral gave a long sigh. "I did not, and do not, understand. But it was a great battle and you came near not winning it. I am right?"

"Quite," replied Aarn grimly. The *Sunbeam* was drifting now. "The momentum-drive was just about ready to break down. It's almost all transpon beams, but even they have their limits, and there are parts which are metallic circuits, balancing circuits. They weren't designed for a strain like that. And I was using, did use, over three times my full original charge during those thirty-seven seconds of battle. Enough power to operate the industry of a planet. Most of it, of course, I got from those battleships. I won't be able to do *that* again. They'll have that carefully arranged. It won't be hard to guess that my tapping ray must have some kind of insulation, and high voltage would wreck it."

"But each of those ships you drained," Mart Toral pointed out, gesturing to the screen, "is now easy prey to our ships. Without power they are falling to the crumbler rays. The new ships, without the protection of their nose armour, are also hard pressed."

They were. Fighting viciously now, the Tornans were pressing in heavily. The cruisers were finishing off the powerless battleships, while the Tornan battleships tore into the remaining Seeset craft.

"When will it stop?" asked Spencer. "Is it going to be a battle to the death of one side or the other?"

"Probably not," Mart Toral replied. "The Seeset ships are swifter than ours, and we have the advantage now. See—they are retreating already. Ah, if we only had ships fast enough to overhaul them, and finish the battle now, when we are ahead. It is always that way; it is more discouraging than defeat. Twice before we had some chance of destroying them—and each time they eluded us by their higher speed."

"Why are their ships faster?" asked Carlisle. "They use the same type drive."

"Yes, but they can generate their power en route. We can-

not. Therefore we cannot follow all the way to Darak at full acceleration."

The brief, deadly battle had broken up. The Seeset ships were accelerating toward Darak at their maximum, meanwhile using their anti-momentum beams on any Tornan ships daring enough to rush after them at a slightly higher acceleration. Gradually they pulled away, with a brief rear-guard action by cruisers, while the destroyer and scout shield formed again behind them. The Tornan fleet waited patiently, gathering the wreckage on the magnetic tractors of the supply ships and battleships, wreckage to be taken to Cornal and reduced to make new ships. Much of it was Seeset wreckage, several million tons of steel armor from destroyed ships. The ultra-violet beam ships were among the wreckage, but they would yield little information. Aarn's destruction of their projectors was too complete.

It was a sad triumph, as always, for five Tornan ships were among the wreckage. A total loss of nearly twenty-five thousand men in this short, comparatively unimportant engagement.

CHAPTER FIVE

MART TORAL'S FACE WAS DEADLY tired as he turned to Aarn again. "You are indefatigable. If our men could only work as you can, perhaps this vast task could be accomplished." He looked about the enormous workshop. Three huge Tornan battleships were in the shop; men were streaming in and out through the great locks, carrying streams of material in and streams of junked apparatus out. Four weeks had passed since Aarn and Spencer had begun the task of putting their devices into production here on Cornal. Five days had seen the Tornan's machines turning out the patterns for the great aggie storage coils, monster coils large as a small house, coils to power battleships. Ten had seen the great coils in production, one made every hour, then two, then finally a total of three an hour. Smaller patterns had been made, and coils as big as a five-man scout ship were being installed in the cruisers. One more pattern type was turning out coils as large as a man for the destroyers, and all other minor craft.

Meanwhile the engineers and scientists had been working on a problem that required individual attention. One of the supply ships had been torn open, her entire interior rebuilt, and in a short four weeks she had been equipped with a giant transpon beam apparatus and the new giant aggie coils. Today she would rise to her orbit about Cornal and send a giant probe reaching out to Torka, the sun, to bring in power for a world at war. Transpon sets for battleships were already in violent production, occupying a large part of the manpower of the planet. Damaged ships had not even been repaired since the battle.

Aarn looked about him and grinned, rather wearily. "I'm pretty tired too, Mart Toral. And now I have to do a lot of research. By the way, your men have all the apparatus ready to install in the *Sunbeam?*"

"Yes, the crumbler projector and the defense. We were waiting for your instructions."

"Good, I'll see to that tomorrow. I've gotten everything started for you here, I guess."

"You have, Aarn, everything. We can never repay you."

"Oh, I'll be repaid, all right," grinned Aarn. "That ship you've agreed to build is pretty husky payment. Spence estimates it would be worth about twenty million credits on our Earth. And—uh—one reason I'm waiting is that I have other things I'm going to develop. Definitely planned. Something Carlisle wants to show me, too. That reminds me—he's waiting now. Won't you come—and you, Spence?"

They took a moving roadway to the Solarian's headquarters on Cornal. Two fully equipped laboratories had been set up, a chemical lab for Carlisle, and a physical lab for Aarn. In minutes they reached it, and found Carlisle seated, talking telepathically with a Tornan chemist. They rose as Aarn, Spencer and Mart Toral entered.

"What's your latest brainchild?" Aarn inquired.

"Something new in chemistry, I'll bet," exclaimed Spencer.

"Well—it is, and it isn't," smiled Carlisle going to his bench. He returned with an eight-inch test tube full of a clear liquid.

"It is and it isn't—new?" demanded Spencer.

"Chemistry," replied Carlisle, handing his specimen to Aarn. Aarn hefted it, looked at it, finally uncorked the tube at Carlisle's nod and sniffed gently, then deeply.

"Looks like, smells like, feels like plain water."

"Again, it is and it isn't. It's water, pure water, and contains neither chemical poison nor bacterial life. But it isn't ordinary water!"

Aarn's face clouded as he looked steadily at Carlisle, then

a broad grin began to spread across his face. "Deuterium oxide, heavy-hydrogen oxide! Heavy water. Hydrogen of atomic weight two."

"I thought it took months to set up and run a deuterium separator," Spencer objected.

"Certainly," Carlisle agreed, "on Earth. This is Cornal, and for some reason its water is rich in heavy hydrogen. And I've been using some of Aarn's devices to separate the light from the heavy. An improved atomic spectro-collector."

"And what might that be?"

"A normal hydrogen atom," Aarn explained, "has a mass of one, and a charge of one—that is the nucleus, the ion. Suppose we shoot a stream of them by means of an ion-gun, letting them fall through an electric field, into a strong magnetic field. The magnetic field tends to separate them, and throw them to one side, because they are moving electric charges in a magnetic field. Suppose, though, that the stream consists of mixed hydrogen atoms, some heavy and some normal. The heavy hydrogen has a mass of *two* and a charge of one. The same force is produced by the deutron moving in a magnetic field as by a normal hydrogen ion moving in the same field, but the deutron has twice the mass to be moved, and so the normal hydrogen will have its course bent more sharply, it will react more readily to the magnetic force. What Carlisle does, I assume, is to shoot a stream of the mixed hydrogen into such a device, and separate them and thus get his heavy hydrogen out at one tube and his light hydrogen out another."

"You seemed overjoyed by the discovery. Why?"

"It means I can get a real supply of neutrons. Neutrons constitute half the weight of heavy hydrogen, and heavy hydrogen represents the best known source for neutrons. You can see that neutrons are important. I have a real use for them right now, too. It—oh, I have some experiments I want to make."

Spencer growled, and looked at Aarn with a dyspeptic eye. "You clam. You've got something in mind, and aren't talking!"

Aarn grinned. "Carlisle—can you make it in quantity?"

"If you say so. But—you'll have to help me design apparatus, Spence, and Mart Toral, we'll have to ask your men to help us construct it."

Mart Toral groaned. "You Solarians have no appreciations of the limits of work. I don't see how we possibly can."

Aarn smiled grimly. "You will. It'll be worth it in more ways than one, Mart Toral. I know that you have influence, so see what can be done. And—I've been holding out a little joybringer, which I will now donate. Come on over to the *Sunbeam.*

"This is important," Aarn continued as they neared the ship, "but the other work had to come first. I knew you'd be lost and gone forever so far as we were concerned, once I demonstrated this, so for your peace of mind, I waited."

He entered the ship, and led the way to the control room. Seated at his controls, he threw a small switch, looked at a table of notes, and set a dial carefully. Then he began working with his regular controls. A scene appeared on the television screen, swirled into color, and steadied. It was a view of the cavern where the *Sunbeam* rested, but a moving view. The scene shifted, the *Sunbeam* itself appearing on the screen, then the control windows. Aarn pointed out the window, and Mart Toral stared in blank surprise at the little black egg-shaped thing that floated there. About the size of a grapefruit, slightly elongated, it hovered motionless, with a blank hole in one end pointing at them.

Aarn grinned inquisitively at Mart Toral.

"By the planets, what is the thing?" asked the Tornan.

"A member of our private spy system," Aarn chuckled. "It sees all, hears all, knows all—and tells nothing. It can slip in unseen where no man can go. It can hide in a dark corner, and move noiselessly. And—" Aarn pushed a switch that made the television screen darken, swirl, and come to life with a strange scene, yet the same, but lighted now in a curious way that eliminated shadows. Men passing outside shone, moving, glowing torches. "It can see in absolute darkness—so called. It can see by radiant heat." He touched another stud, and from the loudspeaker behind the television screen came the sounds and voices

from outside. "It can maneuver faster than any scout. Watch."

"By Torka and her four children, what a spy!" gasped the Tornan. "How far away is it effective?"

Aarn laughed, and suddenly the investigator darted into the open above the hidden buried city, was flashing out into empty space. Still the scene held sharp and clear. With enormous velocity it shrieked out of the last traces of atmosphere, and shot toward the patrol scouts hovering above Cornal. In seconds it had begun to slow, then the patrol cruiser, loafing along, came into view. The investigator nosed gently up to it, and finally stopped with its eye to one port-hole. Men inside were working over the main switch board for the lighting system.

Mart Toral looked at the screen with an expression of deepest envy. "My spy system is nothing, useless, compared with even one of those! Why—you might learn my every secret with that thing!"

Aarn was bringing the investigator back as he answered. "It's yours—for the copying. You'll find that it will take a good bit of work to make them in numbers, and sooner or later the Seeset will spot one, and the secret will be out. But in the meantime, they can be loaded with explosives, and with aggie coils for destruction. You can wipe out a dozen important productive points with these little things . . . but—they must be produced."

"So must anything else," groaned the Tornan resignedly. "I will see what I can do about getting these into production, and also the apparatus you need, of course."

"That'll be fine, Mart Toral. And—er—could you get along without me? I'm just another worker, and Spencer is a better engineer than I am by a long shot, and Carlisle here is the one to work on that chemical apparatus. And—I'd rather do research work."

Spencer laughed aloud, and Carlisle chuckled. "He's off!" exclaimed the engineer. "Go to it, Aarn; a one Aarn-power brain is more dangerous than a battle fleet when it gets grinding good."

Aarn turned again to Mart Toral. "If you want to get started on that right now, go ahead, but if you can wait, I think

I can show you a sight you'll be more than a little interested in. I'm going some place you've never been."

Mart Toral wordlessly buckled his safety belt in place, and settled more firmly in his seat. Aarn reversed his control-switch so that the control board again operated the *Sunbeam* instead of investigator, and in minutes the ship was rising out into space.

As the atmosphere fell behind, Aarn looked uncertainly at Mart Toral. Then: "Mart Toral, I have one thing I have not demonstrated to you before, and one that I am going to use now. It is of no use in your war, and involves such complex apparatus I will not attempt to explain it to you. We are outside the atmosphere. Torka is directly ahead of us. Now—" Torka's flaming disc grew misty, it wobbled strangely and seemed to expand. It expanded more and more swiftly. Some thirty seconds passed, and Aarn readjusted something. The haziness vanished, and Torka was near—and gigantic. The terrible beating heat of the mighty sun flooded the control room with an intensity that raised the temperature in seconds. The men could feel the awful heat burning their skin.

Mart Toral gasped in surprise. "By Torka—you have come here faster than light itself. You can travel at a speed so vast you cover in seconds the distance light takes days to traverse!"

"Otherwise we would never have reached your planet," Aarn said quietly, starting forward again, making Torka once more a hazy, growing disc.

"Our scientists had guessed that," Mart Toral replied, "but no such speed as this!"

Torka grew dim suddenly, as Aarn added the protection of the invisibility, the gravito-magnetic conversion sheath that bypassed the terrific radiation. Still Torka grew. The vast flames that lifted with seeming slowness, yet at speeds of hundreds of miles a second, leaped out half way to meet them, as Aarn stopped at last. Then, on normal drive, he went still nearer! Spencer looked at Aarn in surprise. "Can you stand this? Isn't that gravitational field pretty bad?"

"This is the only way to get what I need," replied Aarn

grimly as the *Sunbeam* went still nearer. A titanic bellying sheet of flame rushed toward them, and the men gripped their chairs more tightly—all save Aarn. With set face, he drove his ship onward. The *Sunbeam* shuddered, mighty transpon beams casting a vast blue glare around them; and they—stopped. The *Sunbeam* trembled mightily, and around her suddenly was a white-hot sheath of flame that wrapped her completely, pushing against her in rushing gaseous force, a titanic white-hot tornado moving at fifty miles a second!

Grimly Aarn drove his transpon beam collector for the heart of Torka, seeking power to replace his diminishing reserves. In less than two seconds the transpons roared again as the power flooded in! The *Sunbeam* battled on. The heat outside seemed to leave her unaffected, to warm her not at all.

"Why aren't we heating?" asked Spencer, his voice taut.

"Momentum wave and gravity field combine to prevent actual contact. Radiation still being by-passed—largely. I'm letting in just enough for sight—about one ten thousandth of one per cent."

The *Sunbeam* was advancing again, the transpons bringing power now that aided her to fight on. "Where do we stop?" asked Spencer.

"When my instruments tell me I've gone far enough. We're about there." Aarn's hands and fingers moved as only a Jovian's could. The roar of the transpons changed its tone, grew deeper still, and the men inside wondered what Aarn was doing. The white-hot rushing gas seemed to glide smoothly by on some invisible surface just beyond the ship.

"What if we have a break-down?" asked Carlisle.

"Ha—you'd never know it." Aarn kept at his work. "That flame outside there would fuse this ship faster than a snow-ball in a blast-furnace. Shut up."

The *Sunbeam* shuddered heavily; and anxiously Aarn eased up on his controls. Still a trembling vibration shook her, despite the wonderful delicacy of the momentum-wave neutralizers. The white-hot wash of flame blanketed all space in a vast, unbearable

glare of light. Aarn's tense eyes were glued to his instruments; anxiously the others watched him. The *Sunbeam* began to buck and toss, the overloaded transpons roaring continuously.

Suddenly Aarn's face clouded as he gestured swiftly toward a slowly moving indicator, a thermostat that recorded the rising temperature of the few metallic bits of the *Sunbeam's* driving circuits. Spencer rose hastily, and went to the power room. The transpon beams were flaming blue, a more intense blue than he had ever seen before. The room was a mass of twisting, flaring blue columns, every transpon beam draining power from Torka, the many subsidiary beams leading to the gravito-magnetic convertor apparatus—everything in full operation. Outside the control room window the sheet of white flame seemed everlasting. Spencer looked at the various gauges, saw the difficulty. The mechanical refrigeration plant, designed to cool the metal in just such emergencies, was overloaded. The ship was heating, heating badly, and with less and less difference in temperature between its own radiating coils and the ship's air, the cooling system was failing. The water had already begun to boil, whereas it should have been solid about the cooling coils. Spencer ran below to the galley, returning in a moment with some fifty pounds of ice.

"I've given her all the ice we had, Aarn. Better start out, hadn't you?"

"Fine idea, Spence. We've been under full power outward for three minutes and forty-five seconds. I've got a load that doesn't want to lift. If it weren't for the force of this gas sweeping by us at nearly fifty miles a second, we'd never even move with the anchor I've got." A brief smile wreathed his face. "The monkey's got his fist in the jar, and a banana in his fist, and he doesn't intend to let go, if he has to take the whole darned jar with him."

"What in blazes are you trying to do?"

"In blazes, is right," Aarn chuckled at the white-hot super tornado outside. "I'm taking part of this sun home with me!"

"Taking part of the *sun home?*" gasped Spencer.

"Right—ah—we're beginning—" Aarn said no more. Something had broken loose below, apparently, for suddenly the vast tornado seemed to be frozen motionless, then gradually began to sweep back, away from them, and they were leaving—"And I've still got my banana!" he laughed exultantly.

Minute after minute the struggling *Sunbeam* plunged and pounded her way out of the sea of flame that washed about her. She was shuddering less now, but seemed to have periods of oscillation when the roar of the transpons mounted, and died. The blue-white tear-drop below them came away reluctantly.

Aarn was happy. He chuckled again, and glanced sidewise at Spencer. "Spence, I'd hate to think what this would cost for power if we had to pay the rates prevailing on Earth shortly before we left. Something like four and a half billion dollars a second, I believe. I've been drawing power at the greatest rate my transpons would handle. All the momentum-wave drive would stand, all the storage coils would take, all the gravito-magnetic sheath would carry, and all my tractor beam could handle. Drawing full on all three tapper beams!"

Spencer looked at the white-hot mass they were towing.

"Now you've got that bear by the tail, what are you going to do with it?" he inquired.

"Take it apart and select what I want," replied Aarn easily.

"I believe anything possible after this," Mart Toral said, wiping his face, and speaking for the first time. "I have seen the completely and totally impossible done!"

"Not half, Mart Toral, not half," Aarn replied more seriously. "I still have a lot to do. I have to select my material from that, and I've got to tow it about fifty million miles to where I can work on it."

"How long will that take?" asked Spencer.

"About three hours, I believe. I'm starting to gain speed now." Torka was still a vast disc, filling all space, but it was contracting slowly. Minute after minute the great transpons roared, but now the over-strained drive was relaxed to a load it could handle.

Three and a half hours later Aarn stopped the *Sunbeam*. The gravito-magnetic sheath had been relaxed, but Torka was still a great disc, and their strange cargo glowed angrily orange, at a temperature of thousands of degrees. Aarn got to work immediately, setting up new fields he had carefully plotted.

"Well—here goes, and Carlisle, cast an eye over this one. It's got your scheme beaten, I suspect. I have about five hundred million tons of matter there—and every ounce of it ionized. Now watch—"

Suddenly a vast gout of flame spurted out of the compressed, tightly bound mass of incandescent matter. For hours Aarn had been holding it in check only by his tremendous forces. Now it shot out through a gap he had made, thrusting out under the incalculable power of released pressure, pressure generated in Torka where trillions of tons of matter had weighed down on it, pressed by the terrific gravitational force of the sun.

The stream bent abruptly, fanning out strangely, and part seemed to wrap about itself, forming a new center, smaller and colder. Most of it curved, some circling half way round, but it escaped, fanned, and spread in space, beginning a long, long fall back to Torka. "It works," Aarn exulted. "It works, Carlisle! I'm getting it—an atomic spectro-separator on a gigantic scale, and I'm collecting no atoms lighter than atomic number *one hundred!*"

Carlisle started, and stared at the swiftly growing dark center. "One hundred! There isn't any known, let alone heavier."

"Not on a planet—but inside a nuclear reactor that big and that violent, a lot of improbable but possible events have a chance to occur. These super-atoms are synthesized.And I pulled that out from about one thousand miles down—just as deep as I could reach before the forces simply tore my beam to fragments. But now that stuff is cooling by expansion—"

The expansion as the ions escaped was cooling it rapidly, and Aarn drove a heating transpon beam into it. Resting almost motionless, his own ship was using little power, and the excess he turned into the seething mass swiftly drove the temperature up, and increased the ionization.

It took over four hours to finish the operation, but at last a great cold ball of matter rested in the beams, while a vast cascade of flaming atoms was falling, falling, falling the fifty millions of miles back to Torka.

"I wish I could work on that stuff right now," exclaimed Aarn as, with full coils, he drew the mass of the gleaming metallic sphere inside the walls of his forces, and set himself for the homeward trip. Torka grew hazy, space changed, and even the stars moved slowly, while three flashing, curved lines represented the three planets as the *Sunbeam* shot toward swiftly expanding Cornal.

In an hour the *Sunbeam* was back in her berth. In half an hour more, workmen under Aarn's directions had cut off a fifty pound mass of the cooled stuff, and put it in a great lead case. The rest, Aarn took out to a deserted island, far from any city. The rays from this mass of super-heavy elements were potent, and deadly. In that mass, carefully separated as it had been, perhaps a tenth of one percent of lighter, known elements had been included. Radium was there, more than the Tornans had ever had before.

"I'm going to get to work," said Aarn decisively, as they landed again. "I want to see what I've got. Carlisle, you can have about five pounds of that stuff if you want it—you might determine all the chemical elements present, and all the properties thereof. You'll probably find some of them are still missing—gaseous substances that escaped—but you'll get them as other, heavier ones break down to form them. And—here's something to watch out for: there will be numerous elements of the same chemical structure but having different atomic weights. Pick 'em out carefully, will you? I'll have some of these physicists here rig up a very high-power spectro-separator for you that ought to catch an atomic weight difference of one in any element less than 350. And—see about the heavy water plant. How much have you on hand? I'll need all you've got to start on."

An hour later Aarn was in his lab. Some Tornan physicists had been called in, and Tornan physics apparatus mechanicians.

All were helping him—blindly. Aarn's science was too far ahead of them for them to grapple with the underlying theory, and Aarn was too busy to explain. Even a Terrestrian physicist of the first rank would have found difficulty in following him now, in his leaping steps.

It took Aarn nearly three hours to get the others working at setting up the necessary apparatus. Then with his notebooks, tables and data sheets he retired to the calculating room the Tornans had arranged for him, where the machines from the *Sunbeam's* mathematics lab had been set up.

Meantime Spencer and Carlisle had been given Tornan help and had set to work on the spectro-separator. Spencer had drawn up the necessary plans rapidly, and was even more rapidly altering them as the work went on. Being an engineer and an inventor, he had not stuck purely to his engineering principles. Where casting should have been used, he was using scrap armor plate, because it was at hand.

It was a weird apparatus that came together in the course of five days, but when at last Carlisle started operations, drawing power from the *Sunbeam* since the Tornan sun-tapping beam hadn't "come in" yet, it worked. They were collecting the separated hydrogen and storing it in tanks.

Aarn was still in seclusion. But he had sent out an announcement. Spencer was to start drawing up plans for the new ship. The Tornans had agreed to build a full-size cruiser—but Aarn was going to make it a super-cruiser. Aarn's own private warship. "We seem," he had said ironically, during the original discussion, "to have more need for a battleship than for a laboratory, so while we have the chance, let's have a real one."

CHAPTER SIX

"At last, Mart Toral," Spencer commented, "Aarn has consented to let his friends know what he's been doing. I can imagine that your Council has been a bit curious to know just how he has been spending his time—and their money—but that's just because they don't know him. Back on Earth he was supposed to work for me. As a matter of fact I worked to support him and his experiments."

Mart Toral laughed. "No, they aren't worried. It's the physicists who have been helping him who are worried. By the time they have one of his new pieces of apparatus partly figured out, he announces that of course that simple little thing was just to help make the device he really wanted."

Aarn ignored their comments as he led the way into his laboratory. It was the mess that always accompanied his work. Dozens of pieces of deserted apparatus stood about, left where Aarn had finished with them. While unused room remained, Aarn simply built the new apparatus there, instead of removing the old.

"And what have you been producing?" asked Carlisle.

"This," replied Aarn. He picked up a tiny, roughly spherical nugget of matter, a ball about the size of a walnut. It glinted white, shiny, reflective in the extreme, and more colorless even than silver. Copper is reddish-gold; gold, of course, reflects golden light; chromium is bluish. This was white, utterly reflective. Aarn held it out at arm's length.

Carlisle was not observant. He held out his hand, not notic-

ing that Aarn's great arm was bulging, his muscles drawn in ridges and plates across shoulder and arm. Aarn dropped the ball of metal into the waiting palm, and the little nugget brushed Carlisle's hand aside effortlessly on its way to the floor. It hit the hard stone with a sharp crack; sent chips of stone flying upward.

"Sweet Satellites! What *is* that?" gasped the chemist, stooping to retrieve it. Aarn smiled at Spencer, and watched. Carlisle's fingers slipped. He tried again. The thing remained where it was. He tried rolling it a little, finally moving it with his foot.

"Good lord—it must weigh half a ton!"

"Not that bad—only about eighty pounds," Aarn replied. "It's the concentration. None of you under-developed earthlings can lift it, I suspect. Want to try, Spence—or Mart Toral?"

Spencer used both hands in a sort of vise effect, and left it where it was. Mart Toral wrapped one hand around the other, and it slipped from his grasp. He rose, and shook his head, a look of awe on his face that a thing so tiny should be so unbelievably massive.

Aarn's super-human fingers gripped it, forced their way under it, and lifted it from the floor. "It's partly the way you go about it," he said. "You have to pinch it off the floor."

"Yes, but what in the—galaxy—is it?"

"I've decided to call it resistium. It melts at about 25,000 degrees centigrade. Density—as you observed—high. In fact about seven hundred and fifty. Tensile strength about ninety-five times that of real good armor steel. One inch of this is the equivalent of about eight feet of steel, with the enormous difference that this is concentrated strength. You could have lifted eighty pounds of steel, because it would be big enough to take hold of. A shell might penetrate three feet of steel, and yet wouldn't penetrate an equivalent amount of this, because the steel shell would flatten like putty. It's rather elastic—you can stretch it half its length and have it snap back. It has the most curious crystal structure I ever saw. The crystals are actually shaped like spiral springs. Weirdest sort of a crystal I ever heard of. The crystal form is always the secret of strength of a substance. That's

why the crumbler ray—crumbling the crystals—ruins a metal. The crumbler doesn't work on this, by the way."

"But what is it? Is it one of those new heavy elements? Isn't it radio-active?" demanded Carlisle.

"No. I made it. It's rather unusual. Flourine won't touch it. Aqua regia does not effect it. Even selenic acid—in which gold and platinum dissolve—leaves it unchanged. Rather indifferent," Aarn smiled. "But you have no idea how much so. I can't touch it at all.

"Atomically, resistium is a structure made up of neutrons, protons—and negatrons. Negatrons which I finally got from those heavy elements I tore from the sun. It has four thousand, two hundred and five in all. Its atomic weight is four thousand, two hundred and seven, for it has two orbital protons!"

"Orbital *protons!*"

"E'en so, my lad, e'en so. Orbital protons. There is an excess of negatrons in the nucleus. They give the nucleus a negative charge, of course. The whole atom contains no electrons. That's the best reason I know of why the normal chemical reagents aren't interested in it."

"What use do you intend to make of it?" asked Mart Toral.

"Poor Mart Toral," sighed Aarn. "It's a shame to tell him. I want about five thousand tons of it—to coat that cruiser. That means quantity production apparatus. But just think what else it means! Make a shell out of this—"

"I was afraid so," said Mart Toral with a mock groan. "I don't know where I can get men to do it."

"Just tell your people I've got the answer of how to end this fight."

"*What!* You can end this war?"

"Yes—and no. You've told me that, even if you destroyed the Seeset fleet completely, it wouldn't do any good, because you couldn't attack Darak against the planetary defenses, and they'd just build another fleet?"

"Aye, certainly, that is our problem. I can see nothing that will solve it before the Catastrophe."

"Exactly right," said Aarn calmly, "so we'll just cause the Catastrophe a little ahead of time. That will end it."

Mart Toral fell back in horror. "WHAT! *Hasten* the explosion?"

"Certainly. The only way to end this, is to bring about the end, and the only end is the end, and the sooner the end is brought about, the more final the end is."

"That ought to end it." Spencer smiled faintly. "Just what do you mean?"

"Well—the only way to stop this, is to stop it for good and all. They're fighting about who gets Cornal when the sun blows up. The Tornans have it now, so if it blows up now, the question is answered for all time. That's the one and only way to settle it."

"But we don't want Torka to blow up," gasped Mart Toral.

"Naturally not. The Seeset however want it even less, and whether you want it or not, it's going to. You can't stop it—but you can start it. Suppose it were a steam boiler, gathering power; the fire is lighted, and can't be withdrawn, and the valves are stuck so you can't open it. Eventually the thing's going to go, and it's just storing more and more explosive power the longer you wait.

"But you could throw a stick of dynamite at it, and set off the explosion before it had gathered too much explosive force. It would be bad—but not as bad as if you waited.

"That's why I say the thing to do is to hasten the thing, set it off before it's ready, and it won't be any worse, certainly. And it will end this war."

"Aye—your reason—your logic is perfect—but man, I don't like it! Tell the Council, tell the High Command—ahhhhh—" Mart Toral relapsed into wordless incoherence of thought.

The High Council and the Supreme Command sat in wooden silence, their faces expressing bewildered amazement.

"But—By the Eternal Mind—you *can't* mean that—seriously!" gasped the white-haired Chairman.

Aarn smiled slightly. "I suspected the proposal would sound insane—so I stated it in its baldest, most simple terms. Remember, first, that I *can* hasten the blowing up of Torka. Now let us see just how poorly situated Cornal is to withstand this explosion.

"She's going to be hot. Terrifically hot. The surface, as you men have calculated, will be raised to the melting point of lead at the equator—the solar equator—and your only hope has been that you could find some system of cooling. That has always been your hope. You knew, of course, that the Seeset had the same problem to meet if they captured Cornal. Have they any way to meet it as yet? We do not know, but—*I have a way!*"

"A way to cool a planet!" gasped the Councilor of Science. "How?"

"I did not say I could cool a planet. That is beyond me. But—I can show you how to cool your cities. Would that not be enough?"

"We could not live! The oxygen of the air will be exhausted and the air would be poisoned beyond our power to purify it in the rectifiers. Our absorbents will be choked in a matter of days."

"There will be such combustion of plant materials and humus outside that the oxygen will be reduced to about one percent, so Carlisle tells me. Had you planned to overcome that?"

"No," snapped the Councilor, "we had not planned how to cool the planet. Until that time—what use to calculate what other problems to meet? How then will you rectify the vast quantities of air needed to maintain all our people?"

"There will be oxygen enough in the atmosphere outside—but it will be combined. All we need do is to extract that oxygen. And Carlisle has found a way. It will require great power—but that we will have."

"What? Will even your power beam be capable of working in that vast hell of flame?"

"No. That is impossible — probably no human machine

could do so, for the force fields that will rage in that explosion will be beyond human understanding."

"Then how can we get all the power we need?"

"From the heat that threatens your cities!" Aarn snapped.

"What!" gasped the Councilor. He had been standing, leaning half across the table. He sat down abruptly. "From—the—heat—from the heat—that threatens us! By the Planets, man, how do you intend to do this?"

"Heat is energy—your trouble is an excess of energy, surely not a deficiency. I have shown you the transpon beam, but I have not shown you the beam that the Myryans, of whom we have told you, used in their collection of energy. It is similar to the transpon beam, but has this advantage—instead of being a conducting beam down which electric fields can act, it is a conducting beam which makes space super-permeable to light. I have tested it, and found that it has the property of raising the speed of light, locally, nearly ten percent. The radiation from the heated walls of your cities would be just as capable of concentration in that beam, as would light. I had in mind, a series of these collector beams, focussing their energies on a resistium ball, and raising it to a blue-white temperature. At that temperature, the resistium radiates not as a black body, but almost wholly in the blue-violet, with practically no lines in the red, so that it appears a deep blue. The photo-cells you have are nearly ninety-five percent efficient, and if we have such a radiator in the center of an ellipsoidal photo-cell chamber, fully ninety-eight percent of the incident radiation will be captured.

"In this way, I am positive, I could reduce the effective temperature of the walls of this city to more than one hundred degrees below zero! I could freeze you out! And all the vast energy of the heat coming through the rocks from above would be absorbed as easily disposable electric power. It would run your air-rectifiers, it would run your great electrolysis plants."

"I—I cannot conceive the thing as a whole, though I begin to glimpse your plan."

"But," Aarn announced, "before we can use this explosion, we must wipe out the Seeset fleet entirely!"

"Ayha—the airiness of him!" snorted the High Commander. "A mere nothing, eh? And for what have I striven throughout my lifetime of service but for that very goal?"

"You have done more damage in the last decade of your life than in the first thirty years of your service," Aarn reminded him, "and now—it may be done. I am trying to show you that, can you once cause the catastrophe, the battle will be *finished.*"

"Aye—I grant that point," nodded the Commander, "but still you have not told how we will maintain ourselves here in our cities."

"This city here is far south of the solar equator—as are all your retreat cities. Only the mining cities and the like are built within that zone, for you realized long ago that that would be the worst region. The temperature here will be more moderate. I can, as I say, show you how to overcome the heat. The air problem, Carlisle has solved." Aarn stepped back and sat down.

Carlisle rose, and in his quiet, concise way described his plan. Poisonous gases would be kept out by maintaining a pressure within the cities slightly greater than the external pressure. Leakage outward would stop the entrance of poisons. Food presented no great problem, since they already knew how to produce synthetic foods. Water could be secured by condensing the vast quantities of water vapor in the atmosphere. The remaining need, oxygen, they could extract from their own atmosphere by means of an electrolytic decomposition of carbon dioxide to graphite and oxygen, which, Carlisle told them, he could and had worked. He concluded: "I have small models of the complete apparatus which I can demonstrate. The waste products and absorbed poisons are thrown off into a separate chamber from which they can be pumped easily and safely."

A Tornan chemist, Marn Fasi, stood up. He had been associated with Carlisle in the development of the actual apparatus. Graphically and quickly he confirmed Carlisle. This man, speak-

ing their own language, a man of their own people, convinced the Tornan council.

They decided. They would blow up their sun!

There was a new note in the workshops, Spencer noted within a week. The knowledge of an ultimate and absolute end to this seemingly endless conflict was alone enough to raise their spirits.

Giant battleships were being rebuilt, and ship after ship was being equipped with the apparatus that was streaming out smoothly now; cruisers were completed at the rate of nearly two a week, destroyers at nearly one every day.

But Spencer was working with a different crew. He and Carlisle and Aarn were straining every nerve to the completion of the great furnaces and new apparatus to make resistium in quantity. In a great workshop deserted to them now, two gangs of men worked. The one was grouped about the nearly completed resistium furnaces; the other about a rising structure of great girders. The battle-cruiser, Aarn's private battle-cruiser, was rising. But it was to be made of beryllium-alloy girders and plates, like those of the *Sunbeam*. Beryllium had enormous advantages over steel in that it was far less magnetic, far less subject to the warping strains of terrific electric fields, more useful in the magnetic atmosphere that was thrown about the ship. But it was a heat-treated alloy which deteriorated rapidly at high temperatures. This ship was being made of it—for its skin would be resistium.

Aarn worked at the resistium furnaces. The last of the lining was in; only adjustments had yet to be made. The work gangs stood aside now, watching. Mart Toral was there, and a dozen or so officers of the Tornan Fleet.

Aarn closed his hand over a heavy switch, and threw it. Relays thundered; and suddenly the cavern was lighted with the glare of great transpons. Feeding, for the moment, into the aggie storage bank.

"'Ware radiation," Aarn called. Rapidly he set up the cir-

cuits. Something screamed in the vast bulk of the resistium furnace. The screaming roar died as the last thin traces of air within were blasted to protonic fragments, and consumed. Then, slowly, like a great lamp heating to incandescence, a dull glow appeared in the thick furnace window. The glow wavered, increased, died almost entirely away, then with the sharpness of a balance suddenly attained, came hard and violent through the window. A brilliant circle of ultra-blue light spotted the opposite wall.

Gradually Aarn advanced a rheostat control. The transpon beams began to roar more loudly, chattered suddenly — then worked in the silence and vacuum of power-riven air. Minutes passed. Tense minutes. Suddenly something whirled into action, a doorway opened, and a white-hot glowing ingot some two feet long by four inches square shot out to clang violently on the heavy rack-stops.

A spontaneous cheer rang out. Their work was done! The first ingot. The first was followed by a second, and the second by a third, fourth and fifth before that first had been at last converted into a casting bed. Then, before that day was done, tools were fashioned, and, at last, rolls cast that could roll the incredible strength of resistium as readily as steel is rolled. The first half-inch thick plate lay cooling as the shift stopped their day's labor. The new ship's skin was under way.

Men all too familiar with such duties had made the hull of the new ship rise with astonishing speed. In four short weeks the giant machines of Cornal had turned out the necessary structural materials for it, and the trained men and their machines had set it up. The hull was finished, the plates of beryllium welded on, and the outer resistium plates were being placed. This was far, far slower, for but a few inches of resistium seam could be welded at a time. The terrific temperature required meant so intense a radiation that the beryllium beneath would have lost its heat-treated strength if long exposed, and even water cooling would have been unavailing.

The interior fittings were a different problem. The aggie coils were available. They were standard equipment now, and were being laid in place rapidly. Transpon projectors were a slightly more complex problem, for each installation was different, but they too were standard, and trained men were available to handle them.

On earth, such speed as the Tornans obtained, would have been impossible, for Earth is not a planet keyed to war pitch by three generations of battle. What might have taken a year on Earth, was accomplished in a month. Again Aarn had given up research for the work of installing apparatus and power boards.

But he stopped again soon—because of an idea that came to him and that required attention. He locked himself in the laboratory, and all others out, save his Tornan assistants.

He came out with an atomic engine, patterned after that of the Magyans, but vastly improved. Neither Spencer nor Carlisle was particularly impressed by it at first. It was large and low and squat, and it looked like the cylinder of an ultra-power rocket-head, rounded and solid. Two transpon collectors were mounted on it, a complex cable led from it to a power board and a smaller gas cylinder squatted at its feet.

"Say—" the engineer exclaimed, "it does look different! The Magyans had mercury boilers, but you seem to be getting direct electric power, instead of using turbo-generators."

"I am," Aarn smiled, "I am. That set of aggie coils over there is needed to show how much power this little baby will give. Watch." Aarn stepped to the power board. His swift movements were too complex to follow, but their result was a rapid development of transpon beams that sprang from the aggie coil bank to the new generator, then a sudden soft hiss—and an explosion of sound and blistering heat from straining transpon beams. Mutely Aarn pointed to the instruments.

"Sweet satellites! Half a billion horse!" Spencer gasped in surprise. "That's just an *atomic* engine?"

"Right," agreed Aarn as he shut it off completely. "Just atomic."

"After all," objected Carlisle, "what good is it? Your transpon beams are infinitely more powerful—you can pick up fifty billion horsepower from a star, instead of a measley five hundred million."

"You can pull a million from a power line to run a ship, too—only there isn't any power-line available everywhere. You can get where suns aren't available, and you can get in the middle of a battle where you can't stop to go get a load of power. This is, I'll admit, more or less of a trickle charge—husky trickle—but it has mighty important uses.

"This baby is going into the new ship."

The work on the new ship went on. She was a full-sized cruiser, nearly twelve hundred feet in length. A long square tube ran down her center; and in this tube were all the rooms ordinarily visited. The great space that rounded out her hull outside the tube was occupied by air tanks, water tanks, air rectifying apparatus, transpon-beam tubes, and, most important, the gigantic masses of the aggie power coils.

The nose of the ship was a gigantic mass of armor; here the huge beryllium alloy girders supported an impenetrable resistium nose that was a full foot in thickness. Behind that, the first of the living quarters, were the rooms to be occupied during rest periods, first the lounge and library, next the men's individual rooms. Then, half way between the ship's center and the nose, came the main control room. It had no direct sight, but television pickups faithfully and accurately portrayed on giant screens set on every wall, the scenes as they were outside. From within, it seemed that the ship was clear glass, that perfect vision was obtainable in every direction.

Behind this room was the forward power room. Here an atomic engine nestled between the momentum drive apparatus and the anti-gravity apparatus. Careful balancing had been necessary to make an anti-gravity apparatus not centered in the ship, lift it smoothly, but it had been done. This power-room alone

could easily power the ship. Yet in the spot midway between tail and center, a second complete power room had been set up. The momentum wave apparatus had been changed too. There were *no* material circuits employed. Aarn had developed a transpon condition which had resistance, and could be used in the automatic balancing circuits. No strain would heat the apparatus now.

In the extreme rear of the ship was the direct-vision observatory equipped with a twenty-inch reflector with a resistium mirror. The mirror had been poured in shape, using a sphere-surface of a magnetic atmosphere, so smooth and perfect no figuring, which would have been impossible due to the hardness of the metal, was needed. Just ahead of the rear power room was the physical laboratory, and just behind it, the chemical. In both power rooms, and the control room, were various thinking and calculating machines.

The ship was nearing completion when Mart Toral asked all the Solarians to accompany him in one of the swift scout-ships that was a mother ship for investigator machines.

"We have, we believe, located the star maps—but we can't get to them."

CHAPTER SEVEN

DARAK WAS THREE-QUARTERS OF a million miles "below". Seventy-five thousand miles away hung Dar-tan, Darak's second satellite, a mass of rock and barren lava fifteen hundred miles in diameter. Four observatories were visible, even from this distance—and several score of forts, each equipped with its own great metal wall, and powerful defense apparatus.

"That," explained Mart Toral, pointing toward Dar-tan, "is one reason why we're stopped. They are equipped with supersensitive locating devices that already have us spotted. A tiny three-man scout can approach. Anything bigger is spotted, and wiped out by the planetary defense forts."

"What defenses have they—the new beam?"

"More fully developed—as an incautious scout discovered. Also a radio-heating ray so powerful even a battleship can't neutralize it. Those are the main defenses—just something too big to be stopped even by a battleship. Their spotting apparatus is mainly electric-static and magnetic, though they maintain an ultra-short radio wave network that is very easily upset."

"What's that?" asked Carlisle.

"Radar," Aarn replied briefly.

"How can the small ships get in, then?"

"They don't—always," Mart Toral replied. "But by coming in on the border-line between the fields of two stations, they cause comparatively little disturbance, because there is already so much from Torka. The solution is just a small ship that will reflect so little that the normal stellar disturbance caused by Torka

will hide it. Even so, a special, peculiarly designed ship is used. It is equipped with fairly broad metal wings that will reflect the waves, and these are rotated slowly, and irregularly. They put it down to stellar disturbance. If they believed their instruments they'd have a ship that varied from an indetectably small one-man ship to a second-line torpedo ship. And they'd be forever sending blasting rays out at stray beams from Torka."

"Humm—interesting," muttered Aarn. "But what have you to show—we're in position, I see."

Nearby was another tiny ship, a similar patrol-ship. She was signalling rapidly with a small monochromatic blinker.

"Wave 184-65," said the Tornan pilot.

"Tune in," Mart Toral directed. "Now watch—we have succeeded in smuggling an observer-machine into the headquarters observatory. It is their rest-period, with only three men on duty. I think I can show you what you want."

The screen lighted. The building was of metal, heavy metal arches that stretched downward from their viewpoint to a metal floor. The peculiar lighting showed that pure heat-vision was being employed, and somewhere down a corridor was a source of heat. It moved nearer, and they saw a very dimly glowing Seeset. "Cold blooded," Mart Toral whispered. "He's been sitting near the heaters." The Seeset walked past, below, and turned in a doorway on the right. Their viewpoint shifted as the investigator followed him, and entered the great room. One gigantic telescope poked its nose up through the metal roof, a mercury seal making it air-tight. The Seeset wandered over, and examined the apparatus that was fastened to the great tube. He had turned on some lights, and now the scene was brighter, though still by heat-vision.

The Seeset turned and started away. The investigator left before he did, scuttled out of the doorway, headed down a new corridor, turned in a doorway and stopped before a closed door. Their pilot was operating it now, and with the skill of practice, he dropped the little machine, caught a projecting hook on the door catch, and lifted. The door opened slowly, then the tiny

machine skillfully closed it again. The room was heated—but evidently it hadn't been entered in a long time, for the heating was so even that it was impossible to distinguish objects. A beam of radiance sprang from the investigator, and lighted on a spot on the ceiling. Swiftly the spot heated, and the glow intensified. For perhaps thirty seconds this was continued, then stopped. The room was visible now in the radiant heat, yet no Seeset, entering the room, would have detected the radiance, nor would he have been able to see it from beyond the door, as he would have a light.

The room was filled with files, rack after rack of them, and all filled with plates, glass plates of every part of the heavens.

"Oh man, that's what we want," groaned Aarn, "but it would take a week to make a selection, and a freighter to carry them back for examination. Don't they have a more concentrated and mobile form somewhere?"

"They have—on thin metal sheets. They are etched on special silver-gold alloy sheets." The investigator moved as Mart Toral spoke. Down past row after row of catalogued plates, till it came to a library of great books, four inches thick, and nearly eighteen inches square. They were bound in leather, apparently, and each was indexed as to number and type of contents.

"Our astronomers and philologists have been working on that problem for several weeks, with the aid of these investigators," Mart Toral explained, and Aarn nodded in appreciation of what it meant—weeks of work of an entire ship and crew with the all-too-rare investigators needed badly elsewhere, working to solve their problem for them. "They have found that the star-maps are catalogued under several types, planetary, near-stellar, far-stellar and inter-galactic work. Then each type is repeated in spectral analysis. The astronomers tell me you will need both."

"Right—both sets—and the whole crew of astronomers. I have a terrible job anyway, but trying to reduce a foreign language and tables and plates—! But how do we get them?"

"That," smiled Mart Toral, "is why we brought you. We

haven't the haziest idea! This is one of the regular planetary defense forts!"

"How in blazes did you get that thing in?" asked Aarn in astonishment.

"We didn't—really. Slaves make up the supply crates on Darak. That came through to Dar-tan—labeled canned meat. If you could see the thing, you'd understand how it got by. It is a wonderful imitation. The top is off now, but originally it had a soldered metal top over the lens. This was melted off when the instruments told us it was safe."

Aarn nodded. "Now for an outside view of that fortress. Possible?"

"Oh yes—" The pilot replied, and changed his settings, as the other ship took over the direction of the investigator inside the fort.

The new investigator was hidden among the rocks outside. Torka blazed down, blue and hot, on the rugged little world. Darak hung huge in the sky. And the vast metal bulk of the fort loomed nearby. It was a great hemisphere, squatting down solidly on a level plateau of fused rock. Nothing could approach without being detected. There were a few stubby lumps on the fort's walls, a few ports—and a great, protected lock-door, large enough to admit a destroyer. Aarn looked at it for a long time. Finally:

"Could investigators open the locks from inside?"

"Yesssss—but not without alarming the whole fort, and all neighboring forts."

"What part of the place is that room we were in?"

"About—there." The pilot pointed to a section of the fort. "The wall is eight-foot steel, then comes a layer of rooms devoted largely to supply storage, then the observatory rooms, and then in the heart of the fort the main defensive apparatus. We never knew how they were built till these investigators got inside."

"Well—I guess we'll have to break our own way in."

"BREAK IN!" gasped Mart Toral. "*Break* into that fort!

And get away with it! They'd ray you out of existence the instant they detected you!"

"That's exactly what *they* think. What do you want to bet they couldn't kill a flea that landed on the wall of the fort?"

"No—they probably haven't anything that will hit their own wall—but they sure would ruin that flea when he tried to escape."

"That too is exactly what *they* think," Aarn grinned. "I don't."

"And anyway, a battleship couldn't break through that eight-foot wall of steel."

"I won't repeat myself again. I have been working on something that may answer that problem. To do what I must, I want two ships—one of the new ten-men scouts, and a destroyer. It won't be in any danger."

Two days were needed back on Cornal, to equip the ships as Aarn wanted them. He modified the ten-man scout to his liking, and in doing so installed a little more apparatus, and tore out all the living quarters, most of the decks, and replaced them with a solid mass of aggie storage coils. The result was a power bank capable of handling a battleship.

The destroyer was equipped with some new apparatus, that amounted simply to tremendously powerful magnetic atmosphere equipment, and an electric atmosphere device. "The purpose of which," Spencer decided, "is to make such a mess of fields that no electro-magnetic field device could detect a mere ten-man cruiser."

"More or less right. The destroyer is going to keep changing those fields, and keep the Seeset occupied while we get ready."

"What's that you're working on—outside transpon-connectors? Why? Who's going to pick up power from you?"

"I am. You're going along, naturally, and you're going to run this end of it."

Several Tornan workmen were approaching. A handler,

a little momentum-wave ship with dangling chains and hooks, led by one of the men, was carrying a squat, massive device. It was a small, square box, surmounted by a stubby, movable barrel. Beneath it was a more complex arrangement of apparatus, entirely enclosed in dark metal and fronted by a small control panel. A second handler carried a complete, small transpon projector set.

"So that's the 'portable' apparatus you wanted. How in the name of the planets do you mean to 'port' it?"

"I won't need a handler there. Remember, the gravity will be only about one-eighth what it is here. I think I can handle it fairly easily. It has a good bit of resistium in it, and that makes it a bit heavy."

"A bit heavy. It must weigh five tons!"

"Ten," Aarn corrected him.

They started the next day. They carried a supply of dark bombs, and had equipped themselves with the space-armor Aarn had designed for the new ship. At their hips swung two pistol-like weapons. Their helmets had no eye-pieces, but were solid, thin resistium, so thin it weighed but a few pounds, yet so strong no man-given blow could break it. Inside, the helmets were equipped with tiny television apparatus that permitted sight by heat-rays, enabling them to see when others were in the utter darkness of the dark bombs.

The ships, driven by momentum waves, reached their rendezvous within two hours. Two million miles from Dar-tan they stopped, and Mart Toral had a last conference with Aarn. Then the tiny ship left her companion, and immediately the greater destroyer began her duty. Tremendous magnetic and electric fields began to oscillate irregularly. Every fort on Dar-tan watched its instruments waver and click from one end of the dial to the other. They located the destroyer, but could not make out what she was doing. A battle-fleet was sent out for safety.

Aarn's scout vanished from the sight of the men aboard the destroyer almost at once, plunging ahead at hundreds of

miles a second. At a million miles—it vanished from all sight. Faster than light, far faster, it plunged toward the satellite. No radar network was disturbed, because the radio waves could not race ahead to warn of her coming.

With the delicacy of control possible only to a Jovian, Aarn watched the satellite expand incredibly. At a thousand miles he abruptly changed his setting. Almost instantaneously the tiny machine halted, but—remained in that inter-dimension! The scout was going faster than light—as it had to be to maintain this inter-dimension—but in an incomprehensibly vast circuit, taking, instead of a shorter route, a far longer. His speed in normal space was near zero. But, not being in normal space, he did not effect the radar, and only slight magnetic and electric disturbances were set up. These were wiped out by the tremendous fields the destroyer was creating. The ship moved forward again, at hundreds of miles a second—stopped—started—and landed within twenty feet of the wall of the fort!

Instantly Aarn was out. A magnetic atmosphere was thrown out now, openly. It gripped into the metal of the fort, and helped to anchor him, a hollow shell that extended from eighty to one hundred feet about the ship. Within, he moved freely.

And rapidly. Spencer, knowing his part, opened the locks. Aarn went to his "portable" apparatus, settled his great arms in the holds provided, and laboring under the load of more than a ton of metal, walked down the gangway that had been thrust out. He was in his space armor, and the ship was already airless, so no locks hindered him.

Spencer followed him, carrying the lighter transpon apparatus. With bewildering speed, Aarn had them set up and aligned, while Spencer returned once more to the ship, threw a relay-tumbler, and waited.

Futile bombs and rays were blasting the rock at the edge of the lava-field. The angry fort lashed helplessly at the ship cuddled impudently at her foot. Then a series of small ships flashed around the corner of the fort. Spencer sent a transpon reaching out from the scout, powered by those gigantic coils

Aarn had installed. Flashing wreckage rained down. These ships were mere one-man and ten-man scouts designed for inter-communication between forts. Destroyers, obviously, were on their way. But their way was long.

Aarn kept a wary eye up, but he was busy. The transpon beam projector suddenly went into operation. Tapping the power of the ship, then throwing it to the new apparatus.

The stubby barrel swung, and pointed at the wall of the fort. A beam shot out, faintly bluish, little sparkling lights floating in it. It touched the wall of the fort in a pencil not an inch across, while the transpons flared and glowed. Then explosively a hole ten inches across was riven, a hole through *eight feet of metal.* Calmly Aarn advanced his stubby barrel. The place the beam struck became a terrific gushing holocaust of flame, a constant, terrific explosion that blasted and twisted the tremendous metal plates, and tore them open like spent fire crackers. In forty-five seconds, a ten foot plug of seared metal swung violently aside, and rolled off before a terrific blast of outward rushing air. Aarn cut off power, clung to his anchored projector, and waited. In a few seconds the rush ceased.

Inside, Aarn found his beam had reached through the eight-foot metal, and also the inner wall of the next tier of rooms. He stepped directly in, and found he was, as he expected, in the room directly next to the observatory catalogue files. There was a door leading between, but it had shut automatically as the air rushed out. Aarn pulled his two hand weapons from his pocket, and trained them on the locks, useless from this side. A stream of faintly visible blue balls rushed from the one; a series of faintly red dumbells spun from the twin barrels of the other. And a white-hot pool appeared on the metal door, grew, and exploded in white sparks as the metal fused through. Aarn moved his sight, the fused spot moved, and finally reached the catch. The door flew open, and a new gust of air shot out. It too stopped in a moment, and cautiously Aarn advanced.

Suddenly ten Seeset, clad in space armor, charged toward him. Their sharls flamed as they saw him, and in an instant

Aarn was a moving, walking tower of swirling, hissing flame. The ions of the sharls were caught in his individual magnetic atmosphere. He fired with both weapons, and the way cleared in a hell of exploding fire.

Aarn passed on swiftly into the observatory file room. The Seeset would have trouble entering, he knew, since the automatic locks would not permit entrance till the air pressure on both sides was equal.

He made two trips with the heavy, bulky books before he returned to find a stream of Seeset emerging from a blasted doorway. They wheeled a light field-gun between two of them, and as he appeared, a blast of red-hot metal blew him off his feet. It was a super-machine gun firing one-inch shells. His magnetic atmosphere became a sheet of steel as the shells remained caught. He was blinded by the swirling sharl ions, but fired blindly into them, watching them gradually diminish as the stream of magnetic bombs sucked them away. The metal sleet continued—till an abrupt and violent explosion, audible even in this semi-vacuum, told him he had scored a hit. Dimly he could make out his enemies now, and he took more careful aim. Gradually their numbers diminished, and as the magnetic bombs swept away more and more of the glowing, blinding ions, he was able to clear the room. He advanced again.

Two more trips, and the remaining books were stored in the scout ship. No more Seeset had entered the rooms Aarn had pre-empted. But a fleet of destroyers swung over the nearby horizon as he put his last load down. Instantly Aarn was out beside Spencer. The stubby muzzle of his projector swung upward, and all the power of its lashing beam swept up to the leading ship. Almost instantly the destroyer exploded with inconceivable violence. A second—a third—a fourth followed it.

The remaining four turned and fled abruptly. Aarn glanced about—and swiftly bore the transpon apparatus into the scout ship. Then he sent out a stream of magnetic bombs that reduced the too-massive projector to white-hot, twisted wreckage.

The scout ship darted upward—and vanished.

In something slightly over two seconds it reappeared beside the destroyer, two million miles from Dar-tan. Somewhere behind them deadly beams were striving furiously to overtake the impudent little ship. Quite vainly.

"It was a shame," sighed Aarn, "to ruin that projector, but it just couldn't be helped. I didn't have time to get it in the ship before the battleships would be showing up, and they were too heavy to fight with that little thing."

"But what in blazes was it? It tore that fort open like an ex-sardine can."

"Steel explosion — super-crumbler — whatever you want to call it. In essence it performs the highly desirable function of releasing the cohesive forces of the atoms in the steel. It turns steel to a gas—under a pressure of five hundred thousand pounds per square inch—two hundred and fifty tons per square inch, and nothing whatsoever holding it in check. The creation of a sudden pressure of that magnitude is apt to be somewhat disconcerting!"

"Sweet satellites! And *how!*"

Minutes later, destroyer and scout-ship were racing for Cornal at the best speed the larger ship could make—which, due to the momentum drive, was high.

CHAPTER EIGHT

"THE ONLY IMMEDIATE RESULT of our expedition," Spencer said ruefully, "is another attack by the Seeset."

"Really, you can't blame them," Aarn smiled. "Annoying when a battle-ship-proof fort is torn open by a minor scout-ship."

"Well, I must say, I don't like trundling this laboratory into battle anymore, especially since we've taken everything out of it."

The *Sunbeam* was an incongruous unit of the Tornan fleet. Only ten million miles from Cornal this time, the two fleets were meeting. Tornan reasoning was logical. The Tornan ships were infinitely superior in speed now—such as were equipped with momentum drive—but there were only fifteen battleships so equipped. The High Command had decided that they had best wait till the angrily attacking Seeset fleet was well within striking distance of Cornal, and far from Darak, before the battle was begun. This time—no ships of Darak would escape homeward to safety!

"The scout action is beginning," Carlisle announced. A cloud of tiny scout-ships, scarcely visible from the *Sunbeam's* distance, was swarming to the attack, the skirmish before the battle. "Tornan ships are greatly superior, aren't they?"

"Question mark," Mart Toral sighed. "That's the right ending for the proposition. Speed, maneuverability, power, weapons. Apparently—but the Seeset have something. We don't know just what. And they have that deadly ultra beam on even their little ships now."

As though at a common given signal, the entire disc of small ships suddenly burst into violent flaming light so incredibly intense that even at this distance, behind the heavy filter-plates fitted snugly over the small windows, the light was blinding. Transpon beams tore angrily at the Seeset ships—and light of intolerable intensity burned back. All of the scouts were fast, mobile, and powerful. But they were not, and could not be, fast enough for this conflict. And small as they were, they could not be armored. Two loudspeakers above the control panel began to speak almost simultaneously. The skirmish of the scout-ships was impossible. Both commanders were recalling their ships, for each fleet was equipped with weapons far too deadly for anything of their size to handle. For the first time there would be no observing scout-fleet for either Tornans or Seeset.

The destroyers never even attempted battle; each had the utmost respect for the other. Rapidly the fleets shifted their formations, cruisers, destroyers, and all minor craft falling back abruptly, leaving only the great battleships to bear the brunt of the conflict. Deadly weapons—against nigh-impregnable walls.

The Tornan fleet assumed a new formation, the usual hemisphere replaced by a great ring, and behind the center of the ring a cone of twenty ships. Cautiously, slowly the two fleets approached. The Tornan fleet stopped completely, and only the Seeset advanced, unafraid because the Tornans had no anti-momentum rays.

Abruptly the twenty ships of the cone darted forward, at a speed of nearly twenty miles a second. Instantly the anti-momentum of the Seeset fleet centered on the advancing ships—and rolled off in vast cascades of blue flame as titanic momentum drives, interlocked to a unit, turned them aside. In twelve brief seconds the Tornan fleet was in range, picking out with deadly accuracy the Seeset ships equipped with the light-projectors. All were not equipped even yet; but they, in turn, attacked.

The Seeset had learned from the *Sunbeam's* attack. The projectors did not explode so easily now. The strange force-mirror protruded beyond the wall of the ship, and covered it for

fifteen feet around, and it turned even the transpon beams.

Tornans, too, had learned. These twenty ships were fitted with strange nose-pieces. Exposed directly to the beams and attack was a coating of metallic alloy with a high photo-electric activity, and a reasonable melting point. What could not be turned, could be absorbed. The ultra-violet light was being turned into power, and shot back at the attacking ships—to an extent. Minute after minute the two forces raged at each other. The whole fleet had joined action now, but there were two battles, a battle within a battle, the unaltered Seeset and the unaltered Tornans in a ring-formed battle about the inner battle of giants.

A shal torpedo brought the first fatality. Somehow it undermined the great protective mirror over the projector of the ultra-violet rays. In an instant the projector was blasted to nothing, a breech in the great nose-cap, and a titanic transpon beam tearing through wall after wall within the ship.

The Seeset turned, darted aside and backward, four other ships combining to cover her retreat—and attack the attacker. The photo-electric protection of the Tornan ships was not effective indefinitely, and gradually now, it was crumpling. Incandescent heat drove it off, and slowly the armor behind it softened, yielded—and failed.

Not one, but all the Tornan ships were weakening. The Seeset were little better off, for while the force-mirrors turned part of the incident energy, with power to burn, and burning it freely, the Tornans were attacking the projectors by heating the entire huge nose-cap to liquid metal.

"One entire force will fail soon," Aarn decided. "The situation is too even to be maintained long. It's a slower thing—but the result is the same as with the destroyers and scouts. Both are too deadly. I think—"

"They have a weapon in reserve," Mart Toral said swiftly.

"Is it ready? You do not know."

"They attacked."

"But—" Aarn stopped. The question was answered. From two of the Seeset ships a new weapon was coming into action.

Green things, visible at their distance only as a floating green cloud in space. But they floated rapidly and directly toward Tornan ships. And as they floated along, *they ate up the transpon beams!*

"Our turn," snapped Aarn. The *Sunbeam* flashed forward. The battle-front expanded, pushed out of their range of vision. Tornan ships shifted as the tiny ship plunged in. The *Sunbeam* was invisible, but both forces knew she was there. The Tornan fleet threw out their momentum-wave shield to aid her, and the *Sunbeam* halted a little in advance, protected against the anti-momentum beams of the Seeset by the combined Tornan fleet. Invisible, the Seeset beams passed harmlessly through her. A flight of magnetic bombs directed at the nearest Seeset ship attracted unfavorable attention as the terrific energies twisted and tore great chunks of metal from the ship's nose. Softened as it was by transpon beams of other ships, it tore in swiftly; then a transpon beam touched the projector slightly, and suddenly it was dark.

Something green and hemispherical and big as a washtub floated gently up toward the *Sunbeam*. Spencer sent a dull-red magnetic bomb twisting gently toward it. The bomb exploded in a rush of flaming red energy—that was gently wrapped up in the green hemisphere, and the hemisphere became a sphere. With deliberate slowness, the green thing slowly faded, and vanished. Aarn pointed—a whole long file of green washtubs floated toward them with a deceptive appearance of slowness. A transpon beam snapped out, and flaming energy lashed at them, drove at them—and was silently, sightlessly consumed by them, as they were consumed by it. They seemed to move faster, eagerly toward the energy of the beam. Aarn stopped. The green washtubs advanced steadily. A terrific rain of assorted electric, magnetic and gravitational bombs tore out at them as Spencer set to work rapidly. Aarn was busy reading instruments. A frown grew on his face; he seemed to have stopped watching what happened outside.

"They've gotten inside the momentum-wave screen of the

fleet," he announced, "and damned if they haven't *made a hole in it!*"

"What?"

"Blazes! Stop them—can't you?" demanded Aarn, looking up. "They're in the magnetic atmosphere!"

"I can't, Aarn—I can't! When one is destroyed, it seems to leave a sort of hole that's safe for another one to enter, and not even a gravitational bomb will enter that hole—it just shies off! They drink 'em up, and leave holes!"

Transpons, roaring already, began to sing a different note, a strained, heavy note, a shuddering note of over-taxed power. "They've gotten in the magnetic atmosphere, and are eating right through it! The energy is pouring in there as fast as we can give it! We've got to move!" Aarn's fingers flew over the control panel, the note of the straining transpons roaring even more heavily; a strange tenseness developed in the ship, antagonistic forces straining at her. The *Sunbeam* did not move!

"They've gotten tangled in that magnetic field, and hold as hard as any anchor could. If I turn off that magnetic field, I can pull free."

"If you turn off that magnetic field," Spencer pointed out quietly, "the present bombardment of material destruction will be churning our separate and separated parts in about five seconds. We've got to yell for help."

Half a mile away a great Tornan battleship had won a victory. Her enemy was fleeing, its nose ruptured. As it fled, a dozen transpon beams concentrated on one spot, and in an instant a great gap appeared in her armor, a clean cut that ran swiftly back along her side. Compartment after compartment was torn open. Explosions wracked her. Her acceleration stopped abruptly. Mart Toral looked, and turned to the radio. Rapidly he called. The powerful transmitter of the *Sunbeam* reached out across the struggling fields of the battle, and brought a response from deep within the great battleship. Abruptly it moved sidewise, toward the little invisible ship, then forward, ahead of it, between it and

the disc of battle. A great magnetic atmosphere stretched out and protected the *Sunbeam* momentarily.

Aarn cut his magnetic atmosphere for a moment, and drove the *Sunbeam* backward. They did not move. *"They're* maintaining the damned thing now," he decided resignedly.

Mart Toral spoke again. Another Seeset ship had been torn open. Another Tornan ship was free. But further down the line a Tornan ship was being protected as it limped to the rear.

The green tube of space-cups had drawn fearfully close to the *Sunbeam.* Aarn rose, and swiftly donned his space armour. Spencer followed his example, and in a few seconds all were equipped. Mart Toral again spoke rapidly into his microphone. Momentarily two Tornan battleships turned aside. From the first, something small and dark shot abruptly, raced with impossible accelerations to a position beside the *Sunbeam,* some hundred feet away. The two magnetic atmospheres opposed violently and it could approach no nearer.

Abruptly there was a rushing hiss of air, then a roar. Suddenly the sound of the *Sunbeam's* transpons died in a vacuum. A great rounded green surface appeared abruptly, a green surface that dissolved the control panel of the defeated ship with steady voraciousness. It was a dull green surface that pulsed slowly as incoming green space-cups added to its mass.

Swiftly Aarn stuffed a number of things into his pouch as he darted down the corridor toward the lock. Spencer had it open when he arrived. Carlisle was last. He stumbled abruptly as the *Sunbeam's* artificial gravity failed, came on at double strength, failed entirely.

"Magnetic atmosphere at full strength." Transpon beams within the power apparatus of the suits whispered to full power, and four bulky figures darted from the lock of the *Sunbeam,* their individual magnetic atmospheres protecting them from the mad effects of the magnetic atmosphere about the ship. Ten seconds later they stood in the lock of the little rescue ship. Thirty more, and they were disembarking deep in the great hull of a battle cruiser. The heat was unbearable. There was a mighty

deep-toned roaring, and the dull, heavy thumping of great guns, soundless, but not vibrationless in their vacuum chambers. Mighty machines were making the entire great ship hum and quiver.

Their rescuer led them quickly to a view plate, and snapped it on. The nose of the *Sunbeam* was gone, a strange rounded, featureless green mass.

"That was an enormously expensive ship—for the Seeset," said Aarn grimly. The green mass tumbled and wavered, shrank and expanded rapidly. "Forward aggie coil bank," he muttered. "They're super-strained space condition. Can't remain stable in this space long. Any additional energy topples them into another—but they pass slowly, leaving a hole in this space."

A messenger in uniform appeared. "The Commander asks the honor of your company on the Commanding Bridge," he said respectfully. The party moved toward the aft elevator bank.

A score of officers sat before the various communicator and view-screens. The roar of transpons was louder here. The Commander greeted them, and pointed. The Seeset ships were gradually retreating; the outer, secondary battle was also being brought to a close. Not far off a Seeset battleship was flaming white in a dozen spots, and beyond, a Tornan ship was infested with green areas of the space-strain cups.

"It is again a draw, I fear. We have destroyed more ships than they—but we cannot fight their new weapon. It eats its way through everything."

"At present," snapped Aarn, "but not for long."

"You have some hope of stopping them, then?"

"I have an analysis of their constitution. I didn't leave my notebooks behind, nor the calculator strips," Aarn replied, pulling the group of books from his space-armor pouch. "For the present, a draw—but next time defeat for the Seeset!" In silence he watched as the battle ended.

CHAPTER NINE

"SHE'S A BEAUTIFUL SHIP, ALL right," Aarn agreed, "but that doesn't mean I'm glad I lost the old *Sunbeam*."

"We really have all the modern improvements," exclaimed Canning. "If this blasted circuit ever gets out of balance or the transpon tie-in breaks somewhere, you'll have to use some new and high kind of mathematics to disentangle the various circuits. You have so blinkin' many now I don't know where they all go. What was that new thing you were putting in?"

"Defense for the steel-explosion. Motto: Never put off on the other fellow what you can't handle yourself. What man makes, man—or intelligent reptiles for that matter—can copy. I'll bet those Seeset are bending all their energies to finding a defense for it, too. But no danger—they won't. Not unless they build a ship that can steal neutrons and negatrons out of the sun. It takes resistium to handle it."

"Since this ship is resistium coated, isn't that defense enough?" asked Spencer.

"No—for two reasons. First, resistium will resist the force, but not stop it. Second—ships have been known to have a hole punched in their armor. If they punched a hole in that resistium, somehow, they'd be able to tear us up inside."

"What's the defense then?"

"Well, the steel-explosion ray depends on a sort of projected field of force—maximum range with the big projectors on this boat is about five hundred miles in space, maximum effective range against destroyer armor about four hundred, against a

battleship about fifty miles. For defense, I have used a projector with a rather rapid-spreading cone. The thing will amount to a duel. The first step is to make the other fellow's ray visible, which isn't difficult because the beam will scatter light, and the second is to meet it with your own break-down ray, which simply opens up his field so that it doesn't do what it's supposed to."

"Have you defense for everything you've got?" asked Mart Toral.

"I try hard," Aarn answered, "to live up to my motto. So far I have."

Mart Toral looked about the great power room of the almost-completed ship. Despite the massive apparatus, there was still a great deal of unoccupied room here, as well as in the other power room. As he knew, Aarn was leaving room for additional equipment, as it was invented and installed. The *Sunbeam* had been rapidly crowded as more and more apparatus was squeezed into it. This ship, a full sized cruiser, had ample room.

"What are you going to call this ship?" he asked suddenly.

Aarn looked at Spencer and Carlisle. "I'd thought of calling it *'Sunbeam II'* " he answered, "but I don't think I will. This is a wee bit hotter than a sunbeam. I wonder—how would *Nova* do? In honor of Torka, which is soon to become a Nova, and it is a new type ship—and a Nova, when it explodes into action, is distinctly disconcerting. I think this will be."

"Good enough!" said Spencer. "Right!" exclaimed Carlisle.

The *Nova* was not officially christened—because a sudden strident alarm rang out in the work cavern. It was an alarm call for Aarn himself. A humming signal told him he was wanted in Cavern III, the cruiser construction cavern.

"Trouble!" he grunted. For a moment he stood motionless. Then he grinned broadly. "The *Nova* moves!"

Swiftly he sprang to the power-room control board. With sudden shattering roars, the great transpons of the new ship sprang into life! The completed power equipment of the *Nova* burst into action. In fifteen seconds the heart of the cruiser was beating with life. Her charged aggie coils were connected

by the vast network of transpon beams, and she was ready to fly.

Aarn moved to the main control room, Spencer and Carlisle ahead of him, Mart Toral following. In seconds the screens had lighted, and the cavern walls spun suddenly, the great corridor appearing directly ahead, to be engulfed abruptly as the *Nova* sped on her way.

The corridor was bathed in a green light that dulled the glow-tubes in the roof. From the mouth of Cavern III the radiation was beating out, green, vicious and fierce. Aarn turned the ship into the gaping opening, and a muffled exclamation of astonishment came from him. Three cruisers were under construction; three were under reconstruction. The nearest of the new cruisers was a half-completed hull, but by her side lay a broken derrick, a mass of splintered metal—and a glowing, pulsing green fire. Something wavering and almost coldly luminous, a terrific green radiance streaming from it that alone carried heat, a green that was shot through momentarily by more brilliant blues and duller reds, and overlayed in spots by dark, dully glowing red spots of sheer hot metal.

"What happened?" a voice roared from the side of the *Nova.*

A thousand minds responded with a confused blur of answers that settled to three salient facts. A derrick had broken; its failure had dropped a five hundred ton atomic generator on the rocky floor, the green fire had sprung suddenly into being and every man had run for shelter. But—some had not reached it; and many who had were clawing, scratching, and writhing in agony, their skins burning and itching horribly, their very inner organs itching and burning, their minds half-crazed.

"Short radiation," Aarn snapped. "Get behind resistium plates, behind other atomic generators, or behind the entire mass of as many cruisers as you can." Aarn was busy over his instruments. Gradually a look of intense interest appeared on his face. "Great Galaxies! Is this a find! Luck—colossal blundering luck! The lady has been good to us for a change."

"Good to us?" gasped Mart Toral. "Good, with half a hundred men dead or dying?"

"Yes—good to us! Look—look, man, and think!" Aarn indicated a board of instruments as meaningless to Mart Toral as a book printed in English, and as meaningful to Aarn.

"Can you stop it?" asked Mart Toral, more practically.

"Oh—stop it. Certainly—at least I think that I ought to be able to—let's see—water—no—sand—no—"

"That isn't just fire you can stop with water or sand, is it?" asked Spencer in amazement.

"Yes, and no," Aarn grinned, turning to his controls with decision. "It would be stopped by water if the water would stick, and sand would stop it if it would melt. I'm getting something better—"

The Nova rocketed back along the passages, Aarn handling the vast bulk of the ship with a sure and deft touch, as though he had been managing it for weeks. It came again to its own berth, where the great resistium furnaces and the heavy water generator, the beryllium furnaces and the negatron extraction apparatus clustered.

Two momentum tractor beams reached out, and some two thousand tons of beryllium ingots suddenly rose. On the other side of the room half a dozen faintly glowing metal ingots, ingots of the extracted sun-elements moved upward. The *Nova,* followed by her two loads, moved back toward the Cavern III more slowly. Aarn moved instantly to a spot directly over the fire, protected from the short, deadly radiation by his resistium hull. First he dropped the glowing ingots clumsily, scattering them across the cavern floor. The green glow had spread now, and already was beginning to wash up the walls of the cruiser, more slowly, but steadily. Suddenly a glint of blue appeared, and it ran swiftly along a tracery of metal, far more rapidly, but carrying the seed of the fire to all things along its path. A heavy silver conductor. Suddenly it exploded into a virulent, blinding violet that spread out a dozen feet into the surrounding air as it struck a heavy platinum circuit breaker.

Aarn picked up one of his heavy-metal ingots on the tractor beam, separated from the others by its fall. The ingot arced up

suddenly, and fell with a crash on the green glow.

Instantly a light so blindingly, overwhelmingly brilliant flared up that the skeleton frame of the cruiser became a giant shadow across the cavern walls; the green glow was washed out, flooded away in an incomprehensibly virulent violet.

Two thousand tons of beryllium ingots cascaded on the heart of the green glow, and a transpon beam licked down and heated it to white incandescence, it, and the infected portion of the cruiser. The whole mass hissed and bubbled into vaporous heat. The transpon died, and the green glow was gone! Only clean, blinding heat remained.

Mart Toral heaved a sigh of relief. "It's extinguished—but what in the name of the planets was it?"

"Our new weapon—new bombs—what an accident to have!"

"Fine. I gather it's a weapon, a bomb-weapon. Now what kind?" demanded Spencer gently. "We seek information, not exclamation."

"The atomic generator broke open, and released some kind of a field that I'll have to study, and that somehow started a slow atomic rot—atomic decay. Transmutation with a release of energy. Peculiarly, the very existence of that form of decay maintains the field which causes it. Radium must have something faintly like it on a limited scale. What happened was that the field started, the tungsten and molybdenum started disintegrating, the iron diluted it, the chromium tended to absorb energy. But the excess was enough to maintain it. That silver bus-bar caught, and the fire ran along it like mad. The platinum, an even heavier element, fairly exploded. That heavy-metal ingot I put on to test it flared terrifically. The light, heavily-absorbtive beryllium diluted and absorbed it. That stopped it. But—do you see what we could do with bombs made of that stuff, and using heavy-element ingots for starting fuel, with an explosive charge to scatter it?"

"The reply to the green space-cups!" Mart Toral cried.

"Right. I'm going to work on that—and then on the star-maps we captured."

CHAPTER TEN

THE COLLEGE OF ASTRONOMY had cooperated with Aarn in his search. One of the greatest problems, and a truly colossal one, was an accurate coordination of data on direction with Aarn's own plates, and with directions from Cornal. The problem of eliminating the motions of Dar-tan, a sub-satellite, was no easy one, but the tables of accurate data the Seeset had accumulated, finally translated, aided in its solution. Then came the enormous task of examining the plates to find at least twenty nebulae known to the Seeset and to Terrestrial astronomy. This meant search after search through the exhaustive star catalogues. Fortunately, all the important papers of the *Sunbeam* had removed when the laboratories were set up on Cornal, and no tables of any importance had been lost.

Graduate students in astronomy did most of this painstaking and time consuming work; then, when partial identifications had been made, the doctors of the college worked over them. Finally ultra-exact measurement had to be made. Then came the even more difficult task of mathematically back-tracing to Earth, and finally of making the calculations to determine Earth's direction from Cornal. It was a job that took weeks.

During that time, Aarn installed in the *Nova* a complete apparatus for projecting bombs of the green atomic rot; the ship was completed in every detail, stocked with supplies, and made "home" for the Solarians. Six hours a day Aarn had it exclusively to himself. Aarn wanted a "decent" gravity—and with the artificial gravity turned up to two and a half earth-normal, Aarn carried on his laboratory work there.

One of his most important problems had become that of finding a means of resisting the terrific light-rays of the Seeset. His invisibility could no longer be used, for his steel-explosion ray could not penetrate it without tearing holes in it.

"Hoist by your own petard," said Spencer sourly. "Give up the steel explosion. You've got enough other junk."

"Oh no, never give up anything. If two things fight, find a way through it. There are a number of good reasons for this, one of the best being that I have nothing else to do right now."

"How about the space-cups of the Seeset?"

"I told you—you can't stop them. Impossible. Any energy you use to attempt it will simply make them anxious to swallow it and go where it came from."

"Well, how in blazes do the Seeset make them attack us instead of them?"

"They'd attack a Seeset that got too near one. But the apparatus that manufactures them evidently builds up such a strong field that they are repelled from it. Hence that device I showed you. It throws an attractive bomb. The space-cups eagerly rush to get at it, and do—but they get each other, too. Every bomb of mine ought to take in about a dozen of theirs."

"What are your other reasons, then?"

"Sometime I may meet a ship that will take every single thing I've got and be yelling for more. The more I have—the more I can send him. Sometimes a sheer mass of defense is useful, remember."

"What do you mean by mass of defense?"

"Never was it more truly said of anything than of space warfare: a strong attack is the best defense. If I send them a hundred billion horsepower, they have the pleasure of handling all that hot stuff before they can think about an attack. Also, the idea I have for taking care of that light-beam will help in any circumstances. It will stop any ordinary radiant energy.

"I'm going to use one of those Magyan funnel-beams. They absorb all incident radiation, and pass it on to any point I select. But the point I select can be either of two: I'm going to have a

resistium ball floating on some magnetic atmospheres, in a photo-cell room. That will take care of about a billion horsepower. If more comes—as I fully expect—I'm going to have the other end of my 'funnel' open into free space on the other end of the ship. Do you see what I mean?"

"Pass it through the ship—but how? You'd have to have a huge tube clear through the thing, and there isn't any."

"Ah—there's the problem. The rest is easy enough. What I want to do is to make a tube through the ship *invisible!* I'll pass the radiation through that tube, without having the whole ship invisible. That way I can have my steel-explosion and the protection too."

"Sweet—but where is the tube to be?"

Aarn showed him, on the plan of the ship. It would miss the control room, and the power rooms, and pass through the uninhabited storage space. The ship would, to the Seeset, appear to have a tremendous hole cut clear through it, from end to end—and still be whole and very, very dangerous.

"Apparently you plan for a real battle next time."

"The next battle," said Aarn seriously, "will be utterly, and completely decisive. The Tornans have practically finished equipping their ships, they've stopped constructing new ones, and are concentrating on the utmost protection for the old. They are all being equipped with the space-cup diversion bomb apparatus, aggie coils and transpon apparatus, and some of them are being equipped with the steel-explosion. Many of the cruisers will have invisibility."

"How about the Seeset? Won't they simply retire in good order again?"

"No. This time the Tornans are determined, and able, to prevent that. They have a whole battlefleet capable of out-racing the Seeset now, remember, and Mart Toral's latest information, from his spies and so forth, is that they have one super-battleship under construction, one they're putting everything they can into, but little so far is known that's new. Their precautions against investigators have been successful in keeping 'em out, and all we

know is that it will have far heavier armor—and be a full mile in length! A super-super battleship."

"And then some! When does this battle begin?"

"The Tornans intend to begin this time—in just one week and a half."

It was a slow week and a half. It seemed to crawl. But the last of the battlefleet preparations were completed, stores laid in, the atomic-rot bombs, with which every ship was equipped now, were racked.

Massed, the Tornan fleet rose, and in it now, with the cruiser squadron, rode the *Nova.* Her crew was six, for Mart Toral was again accompanying them. Every ship was equipped with the momentum drive, and could have made the trip in hours, but slowly, at a rate that took them nearly five days, they made the trip. Seeset forces must have time to gather.

The Seeset did *not* gather. More and more worried, the Tornan Command watched their screens, and their telescopes. The Seeset workshops swarmed with laboring workers, the scurrying of heavy work continued—but the Seeset fleet remained grounded, save for a patrol force scarcely five thousand miles from the planet. They did not choose to fight.

"It looks," decided Aarn, "as though they were not quite ready for battle today. Won't you come some other day?"

"This is the first time they have ever refused battle," Mart Toral said worriedly.

"It is also, I believe, the first time you believed you could completely wipe them out."

"It isn't the first time *they* thought so," Spencer suggested, "but it is evidently the first time the Seeset also thought so."

"But what are we to do? They are continually strengthening, we are already as near the planet as we dare come because of the planetary defenses. They have already had nearly a week more preparation than we had; we must get them to fight."

"Well—hold on!" Aarn called.

The Tornan fleet hung now, in battle array, nearly three

million miles from Darak, waiting hopefully for an attack. The *Nova,* placed near the center of the line, shone whitely in its resistium armor.

"Have your investigators or spies learned anything new in the way of planetary defenses there on Darak?" Aarn asked.

"No—but remember they didn't need anything really new, with their ion-beams in air, the anti-momentum beams, and the various material forms of destruction. That light-beam is a super-super light beam with a whole planetary power system behind it."

"Then," Aarn decided, "I'll see if we can't bring 'em out." The *Nova* started, dove swifter than light toward Darak. Aarn was going to incite hostilities.

In seconds the *Nova* screamed through the outer, tenuous reaches of the atmosphere as Aarn suddenly threw her back on normal dive. Now he was low, though, low over a vast forest. At least—so low that the great defense stations were hidden from him, and he from them. The *Nova* was moving still at a pace so terrific that no directing device could have followed it at that comparatively point-blank range. Shrieking through the air at nearly fifty miles a second, even the resistium hull warmed up slightly, despite the protective influence of the momentum wave apparatus, for the momentum-wave was decelerating the ship now.

Scarcely a mile above the surface of the planet, the *Nova* leveled off from her erratic dive, and shot along the surface of the forest at nearly half a mile a second.

Abruptly it seemed, a city loomed huge on the screens. Aarn stopped the *Nova* dead, and from her bows there streamed concentrated destruction—material Shal torpedoes that wracked the very bones of the planet in screaming ultra-sound, whirling dumb-bells of magnetic force and blue-glowing electric bombs, and three terrific transpon beams that tore and sputtered at the great roofed area that was the construction shed.

The thin metal roof and sides of that shed vanished like tissue paper in an oxyacetylene flame. They did not melt, they sputtered, and sparkled, and vanished. Mighty, looming grey-white iron and armor-steel hulks were disclosed, their walls be-

ginning to glow under the lashing beams. Instantly the Shal torpedoes and energy bombs shifted their attack to these more worthy foes. The construction shed became an intolerable inferno of energies, a rocking, roaring mass of crystallized sound and light.

A cruiser, half finished, slumped inertly downward and inward. Two of the four battleships rocked and rolled under the attack. The other two rose slightly, turned in precise coordination; tremendous light-beams shot out—and half way, vanished!

Aarn turned, and retreated around the curve of the world as swiftly as he had come. Half around the planet he paused again at the great Seeset destroyer base.

Twenty minutes later the *Nova* rejoined the fleet lying off Darak. The destroyer base was a glowing white point of light on the turning globe-map of Darak.

Mart Toral turned to Aarn with a slight smile of satisfaction. "The Commander wishes to report that signs of mobilization have been definitely observed."

"The Solarians wish to report," replied Aarn gravely, "that if that didn't get 'em out, nothing would."

Two days passed before the Seeset fleet swam slowly up from Darak. In those two days, much other work had been done—including the placing of a great many battleship light-beam projectors in every city—dozens of them. No more sudden raids were to be countenanced.

At three million miles the engagement began. The scout-ships and the destroyers of the Seeset were driven back almost at once. The cruisers battled hotly for less than an hour—and the Seeset cruisers gave ground as the mighty hulls of the battleships moved up. The Tornan cruisers retreated behind the first-line Tornan ships, waiting to snap in and worry the wounded prey.

The *Nova* moved up with the first line of battleships. Instantly she became the target of a dozen ships, a dozen ships viciously angry to avenge the swift attack she had made. Light beams of millions of horsepower tore in—and harmlessly through her.

The *Nova* throbbed suddenly to the rising power of the steel explosion ray, then sudden, utter quiet reigned as the great antimomentum rays of the Seeset bit in. The *Nova* was ringed with blue fire. From half a dozen Seeset ships, hordes of the green space-cups poured out, streaming eagerly toward the Toman fleet, and the *Nova*.

Abruptly they twisted aside, turned, and poured even more swiftly into perfectly empty spots in the vacuum of space, poured in—and through. Wasted. From the *Nova* a gloriously violet sphere floated out, moved abruptly under a momentum-wave pressure beam, and shot at terrific speed for the nearest of the Seeset ships. With contact the violet sphere burst in flaming violet rain that settled swiftly on the ship, and its near neighbors. The violet changed swiftly to shining, bright green, cold green fires. The fires spread, each little center fanning out swiftly till the battleship was overrun as with luminous green paint. Only the silica windows remained clear, where the steel port-plugs fell away, their cleats rotted out by the atomic rot. Screaming shells crashed into and through brittle glassy windows. Inside the ships, men continued in airless vacuum, their protective space armor covering them. The green rot ate around the opened windows, and bright spurts of violet flame lighted the darkened control rooms as the silver cables and the platinum relay-contacts flared in swifter atomic rot. Racing along the silver cables, swift-rotting metals, the disease spread to the engine rooms, the accumulators, the generators.

The Seeset ships employed gigantic mercury boilers, heated by atomic disintegration. The green rot reached them, ate through the steel walls, till they exploded. A single vast violet flame marked the swift consumption of the heavy, rich mercury fuel, and the even swifter destruction of the Seeset's own atomic fuel.

In scarcely twenty minutes the whole process would be completed. Four Seeset ships were hit by those bombs that spread atomic rot. Four lessons were enough. Before the last terrible flare of virulent violet flame arose, they knew the atomic rot was deadly. Thereafter the anti-scout-ship guns and light-beams dis-

posed of them, blowing them to fine-scattered dust, where the atomic disintegration died in dilution.

A great battleship loomed out of the dark of space directly before the *Nova;* she was spotted now with the green atomic death, but still deadly. Her anti-momentum ray grew more deadly as she came even closer to the ship, the cone narrowing till it included only the *Nova.* Aarn depressed a key. Heavy relays sounded close and so loud they penetrated even the silence and the hag-whispering of the anti-momentum beam. For an instant nothing happened. Then, terrifically the nose of the battleship split wide, a thousand shattered fragments flew out, stopped in glowing heat in the *Nova's* magnetic atmosphere. Swiftly the terrific explosive action retreated through the lighter bulkheads behind, a series of soundless, pushing explosions that rocketed the battleship back, and split her open from end to end. Suddenly she was washed in the violet flame of the burst mercury boilers coming in contact with the atomic rot.

"One for our own," exclaimed Aarn. The *Sunbeam* would be paid for.

Aarn turned. A Tornan ship was hard-pressed by a Seeset, equipped with both light-ray and space-cup apparatus. A hole glowed white in the Tornan's nose. His transpon projectors had been eaten away by the glowing space-cups. The diversion fields Aarn had produced were not always effective. Aarn moved swiftly. The Seeset ship suddenly rocked under the terrific impact of the steel-explosion.

Aarn turned abruptly away, as two Tornan cruisers shot forward to harry the hard-pressed Seeset ship. The Tornan battleship was still active with its bombs and torpedoes. A mud torpedo squashed stickily, and blasted terrifically into the forward engine room of the Seeset ship.

Aarn's transpon beam tore at the light-projector of a Seeset battleship. The Seeset replied with a stream of green cups, which Aarn met with a diversion field almost in their path. They clustered thickly, and vanished. More thickly — the *Nova* darted away, and attacked viciously from the other side.

A stream of Spencer's atomic-rot bombs blossomed, and vanished in white, incandescent dust as the smaller light-rays volitilized them with astonishing accuracy. A Shal torpedo got into position, and clung, grinding, on the nose of the Seeset. Less luminous, it had been harder for the light-ray men to spot.

Aarn smiled. Spencer was keeping the enemy well occupied now, and Carlisle's thermite bombs, Shal torpedoes and flourine gas bombs were annoying him. Aarn turned again to his complex panel, set a dial, and pushed over a control slowly. He had an idea.

Deep in the heart of the Seeset ship, the engine room was well protected. Its walls were lined with great accumulator stacks. The center of the room was occupied by a battery of six huge mercury boilers. Engineers watched them carefully; they were working at 150% maximum just now, and were decidedly strained. The many pieces of apparatus that had been installed took a terrific toll of power, and there simply was no more room for boilers.

On the lattice floor above, the great turbo-generators were sighing deeply, steadily. They too were overloaded, but that was less serious; it was simply a matter of cooling.

"Engine room. Engine room. The Commander wishes to know have you had a break down? So far as he can see there's lots of power going out and none coming in," said a sarcastic voice from the loud speaker system. The Chief Engineer looked up from his control panel, scowling. He flipped a microphone switch and spoke.

"To the Bridge. To the Bridge. We're working at 150% capacity down here and can get no more from the boilers. As it is—"

He stopped abruptly, staring. Because his generators had stopped with a horrible snarl. The turbines had, too. The machinery about him had stopped, the ventilation fans, the air rectifiers, the pumps. All had stopped. Abruptly there was a roar of mercury vapour escaping through the safety valve. It mounted

swiftly to a screech as the Chief Engineer with a hopeless gesture moved to cut off the atomic fuel in the boilers. The screech mounted for an instant more as the Seeset engineer watched in fascination the slow bulging of the great welded steel boiler plates. They stretched quite a bit. He wondered how long it would take. The escape valve was open, but that was just to let off an emergency head of mercury vapor, not to handle a full 150% development of pressure. The atomic fire would not die for another three minutes.

The steel bulged so slowly he could see the flakes of oxide and paint jump off. The men all around him seemed frozen. One was frozen with a foot in air, as though running for safety. The screech was very loud, a deafening thing—

The steel boiler plate opened out like a swiftly blossoming flower of flame—

The steel wall of the ship burst outward and the battleship was split into three parts as the two forward engine rooms and the two rear boiler rooms exploded.

"The anti-momentum beam has other uses," said Aarn, "than merely stopping a whole ship. I thought those boilers would burst."

Around him, Aarn saw cruisers hurrying forward. A too-eager Tornan cruiser glowed white-hot, and a gush of air poured out as the metal slumped, molten.

Aarn saw the Seeset fleet was scattered, retreating without order. The battle had broken up into a score of dog-fights, with two Tornan ships for every Seeset. A long stream of supply ships reached out Cornal-ward across the void, towing huge masses of twisted, glowing metal. Seeset ships were jerking and straining wildly in the grip of great momentum-wave tractor beams. The trapped ships were being sectioned by transpon beams and, here and there, a steel-explosion beam. The battle was over.

CHAPTER ELEVEN

THE SHOP WHERE THE NOVA HAD been made was still a center of intensive, full-scale production. The shops where cruisers and battleships had been made were staffed with a skeleton crew of workers repairing the damaged Tornan ships, while the destroyer and scout-ship shops were closed down, as such, and had been converted to making a new type of supply ship, a ship with mere two-inch steel walls, and the lightest of internal bracing. They had momentum-wave driving engines, and anti-gravity coils, so they never would have to resist great strains. They had no weapons, but the entire ship was packed solidly with huge aggie coils.

The manufacturing forces of Cornal were marshalled to one greater task. Half the Tornan fleet was cruising constantly around Darak, just beyond the planetary defenses. Darak had a fine, alert patrol fleet now—but it was a Tornan patrol. Not one Seeset ship had dared to set its nose for space since the Last Battle.

The patroling Tornan fleet had been making life for the Seeset a hell, by dropping huge Shal torpedoes, without rockets or any propelling power, only anti-gravity devices to keep them from falling too rapidly. Some of them, particularly on the night side, were getting through. The aim was necessarily poor, but the Seeset never knew when chance would favour the Tornans and send a screaming, rending Shal torpedo into the heart of a city. Bomb dropping from a height of 100,000 or more miles is not accurate, even when a whole city is the target. But it was disrupting affairs on Darak. No new fleet would be built.

Meanwhile Cornal was preparing for the climax Aarn had planned for them. The scrap steel from the Last Battle was being converted to make a new fleet of supply ships, freighters—large as battleships, and with less armor than a spyship.

A tremendous force of men were engaged in the work of making hundreds of the Myryan collector beams, and setting them up, changing the plans of their cities, leveling buildings near the walls, and making the walls more nearly plane. Others were installing new types of locks, and drilling great tunnels beneath the surface, where possible, connecting city with city. Shal explosives did a great deal of the work, the crumbler beams helping.

The resistium plant was turning out the strange metal at top speed to supply the necessary re-radiator spheres for the cooling machines. Great electric plants were hastily being assembled to handle the new loads. Still, two months would be needed. But two months was an incredibly short time for this job; only a world keyed up to war production pitch for over two generations could have done it.

At the end of a month, half the work was done. And the new fleet was ready. The artificial pre-ignition of the colossal explosion was to start. For days the newly made supply ships had been streaming out across space toward distant Ranlor, planet One. They had landed on the hot globe, protected by the Myryan collector beams, and set up their apparatus. Battleships had accompanied them to protect and aid them.

Planet One was not a large planet, little more than three thousand miles in diameter; and the new supply ships, and the battleships and cruisers had bedded down on the planet at regular intervals. The entire surface became studded with the ships.

Aarn's plan was nearly ready to go into operation. The *Nova* had arrived, and the High Command, in the Flagship *Cornal,* was on the way. The College of Astronomers was aboard the *Cornal* now, ready to take up the work of maintaining an accurate check as the process progressed.

Then the Seeset created a diversion. From the Tornan patrol circling Darak came sudden messages of distress, messages hours

late, due to the slow crawl of light in this vast solar system.

"Seeset super-ship has appeared from under-ground workshops. It is, as reported, of tremendous size. Five available battleships concentrating on her." A few minutes later: "New ship driven by momentum wave system! She is armored with magnetic atmosphere which stops all our material weapons, in combination with her momentum-drive. She is also equipped with anti-gravity devices. The aggie-coil power storage system has also been discovered. Battleship *Thor Manti* destroyed by pencil-crumbler ray. Steel explosion ray useless against her. Name of super-ship *Darak*. Atomic rot bombs have no effect, dying out almost at once. Battleship *Ran Saro* destroyed by combined crumbler ray and light-beam. *Darak* unaffected by transpon beams. Magnetic bombs deflected by magnetic atmosphere. Electric bombs ineffective. Gravity bombs have no effect apparently, exploding harmlessly in vacuum in center. Tractor and pressor beams useless against momentum drive. We are attacked by new type bomb. Stopped in our magnetic atmosphere, however. Radiating—radiating in gamma region. Intense—passes through steel walls with dangerous effect—burning. Ionization in ship—"

The message broke off. Aarn looked owlishly at Mart Toral. "Your spy system was defective," he decided. "I'd advise a hasty retreat on the part of this fleet here. Those supply ships will be just so much meat for that baby—but with their super-drives, they ought to get to safety. I'm going to investigate in the *Nova*. I think I'll find our friend on the way here. I haven't heard of anything we can't handle so far—"

"How about those pencil crumbler-beams?" asked Spencer.

Aarn looked at him with an expression of pain. "Dear lad—I've been expecting that for months now. I have the same thing myself. Developed it during the past month. I had the defense installed on the *Nova* when she was built. Didn't have time to put it in those other ships."

Mart Toral had been talking rapidly. The fleet of ships was already rising from Ranlor. Aarn started the *Nova* up and away from the planet. The red-hot globe vanished in ghostly images

as the ship exceeded the speed of light. Half way to Darak, Aarn slowed to normal speed, and investigated.

Perhaps a hundred thousand miles behind them, the *Darak* was cruising through space. She was making the distance increase at a tremendous rate. The *Darak* was very evidently swift.

The *Nova* started after her. In some fifteen minutes the true size of the *Darak* could be determined. She was seven thousand five hundred feet long, and eight hundred feet in diameter.

"That," Aarn exclaimed, "is a whole fleet in one big lump." The *Nova,* lightless now, was almost invisible from the *Darak,* and so tiny in the infinitude of space that she was lost. Aarn spent some time working carefully with his instruments, taking very delicate readings. Finally he sent out a very small, and very special type of torpedo. It was a miniature, self-contained spaceship, equipped with an extremely complex series of controls. It would do no damage at all, and it would be utterly destroyed. But, Aarn hoped, not before it had worked its way through the protective screens of the *Darak.*

It struck the anti-gravity field first. Very delicate apparatus set up a field which agreed perfectly with the *Darak's* field, and the ship went on. It reached the magnetic atmosphere. The apparatus analysed it, and adjusted its controls so that its own field matched. It struck the momentum-wave field. Instantly it slowed to exactly the pace the *Darak* was making. Then very slowly it crept onward. So slowly that it disturbed the *Darak's* own field no more than the light-pressure of the great sun did. It took it nearly twenty minutes to touch the side of the ship's hull.

Then a stream of white-hot thermite spurted out, and instantly a blazing spot of incandescent vapor rose from the wall of the giant ship.

Back on the *Nova,* Carlisle had been watching very carefully. An automatic device also had been watching, and when that blaze of light came, a series of twenty spectroscopic readings and photographs were taken. Carlisle set to work.

"It's a beryllium alloy, with a very small percentage of copper, iron, manganese and vanadium in it, and, I think, some

aluminum, though naturally, I can't be sure about the iron and aluminum. Too much of our own running around free. But it's at least 90% beryllium.

"Hmmm—naturally it stopped the atomic rot. Put it out, in fact. I think he's looking for us—yes, and he's found us." The *Darak* had turned, and was now slowing so that the *Nova* would come in easy range. The *Nova* also slowed, and stayed out of range. Gradually Aarn let the *Darak* get just within ultimate range of him. The Seeset ship opened with their light beam. Aarn raised his eybrows.

"He's got a beam that's tight as a Scotch miser, and it's hot as a star's heart. I'm not even taking a levy on that one." The hag-whispering of the anti-momentum beam started abruptly. Blue fires radiated from every point. "I was expecting that," came Aarn's thoughts. "It's in perfect keeping with his size. Also, he's trying to use one that gets several smaller sizes than the old ones did. Well—we'll see if he's got engines." Aarn moved. For some moments he watched his instruments. "I stopped his fans and such, but he was expecting it, and increased his momentum wave intensity to meet my band. That's that. Now let's — whoa, not so fast." The *Darak* had been well equipped with momentum drive. She flashed toward the *Nova* at terrific acceleration. Aarn got to work rapidly, and in a few seconds had arranged an automatic hook-up to maintain the present separation.

"The Tornan ships had a non-adjustable explosion ray, but I think mine is better." Aarn was already working with a notebook beside him. In some ten seconds, during which the *Darak* tried vainly to get closer to the elusive *Nova,* Aarn was ready. The mechanism was now a beryllium-explosion ray, readjusted to the different crystal structure of the beryllium alloy. Aarn tried it out. Instantly the instruments quivered violently, and a spot ot brilliant flame shot and sputtered along the *Darak's* walls.

"Hah — he's actually got the defense fields. That's out. Brother, those reptiles sure have brains! I'll expect an explosion ray myself pretty soon!" Aarn grinned delightedly, and settled

himself more comfortably into his seat. Swiftly, with atomic generators at full power, he coupled in all his aggie coils, and drove out a twin beam of concentrated transpon power. The *Darak* flamed violet over all her surface—but the explosion of energy was not actually on the Seeset ship, but on a sheath of transpon-like condition just beyond her metal walls. Spencer was trying a varied collection of bombs—but entirely without result. The *Darak* was trying to reach the *Nova.*

She had the anti-momentum beam on, but it wasn't effective at this distance. Whether it would have been had they been nearer, Aarn could not tell. The anti-momentum wave died abruptly, and a crashing roar of transpons within the ship burst out as the noise of their own power became audible again. Abruptly the *Nova* reeled under the impact of a terrific tractor beam. She trembled slightly, then held steady, a flowing violet-blue sheet of flame washing swiftly past her, and vanishing in the direction of the *Darak.* Aarn returned with a pressor beam. The tractor deflected away sharply.

"Aarn," Spencer asked, "how did that Seeset stop your steel-explosion ray? I thought that took resistium."

"No. Making it does. Somebody analysed it and passed on the glad word. Besides, he didn't have to stop it at that range—he just barely felt it. However, I assume that he could stop it because he had some kind of a reaction against it, and what's the sense of making that apparatus if it doesn't do a complete job."

"Going into battle range? You're just tickling each other."

Aarn chuckled. "He's tickling me with a hundred million ton tractor beam now, and trying his light again. I'm going in for fifteen seconds though. Then I'm jumping out again faster than light, just to make sure. If I like him, I'll go back at him."

The *Nova* suddenly stopped eluding the *Darak,* and sped toward her with all the lashing acceleration of which momentum-waves are capable. In less than three seconds the two ships were motionless within ten miles of each other, the thousand foot cruiser and the mile and a half of battleship.

Aarn started his beryllium-explosion ray with everything he

could get behind it. The *Darak* flamed in defense. Nothing happened. They had a complete set of defense-ray cones protecting them. Aarn tried direct, concentrated transpon energy. The *Darak* didn't seem to mind. Her light-ray was funneling in and through the *Nova* harmlessly. Her space-cups were streaming in a constant ribbon into the dozens of attractive centers Aarn had set up about himself; the glowing gamma-ray bombs floated toward him, and stuck in his magnetic atmosphere—but their rays stopped dead at the resistium surface.

Then—a tongue of gaseous flame shot out, darting across the ten-mile gap with appalling speed. It was evidently an ionically projected flame of incredible heat. Its molecules passed unhindered through the magnetic atmosphere; seeped through the gravity field and the momentum waves. And licked at the resistium till it glowed blue-hot in an instant. Aarn grimaced as his "eyes" for the various view screens went dead. Fused.

Aarn retreated hastily to several hundred thousand miles, just as the full terrific force of the tractor beam at short range reached for him. Faster than light, the *Nova* outraced it.

Five seconds, and the *Nova* darted in to attack again, this time equipped with a new set of eyes—and a magnetic atmosphere that extended far, far into space. It touched the magnetic atmosphere of the *Darak* as he came into position. The flame licked out again—and spread over all space as the still-uncombined ions were shot swiftly to one side by the magnetic field.

The tractor grabbed the *Nova* instantly this time. The *Darak* wanted no more escapes. The *Nova* roared in protest, shuddered, moved slowly toward the *Darak*—and halted as Aarn cut the tractor with his own pressor. Again and again the tractor beam sheered aside as the pressor beam pushed at it.

"Mutual testing period," chuckled Aarn. "We've got a reputation. That—there it is." The crumbler had arrived, a pencil-thin beam of terrible, driving, crumbling radiation. So terrific was the energy it bore that it would have acted as a sheer heat ray, had not its crumbling action reduced crystals to powder first. It spluttered, arced, twisted and flared on the resistium wall of

the *Nova.* Again the resistium was white hot. It withstood the temperature easily. The Myryan collector beams prevented radiation of the heat inward.

"Well—that's all we know they have. Now I wonder if they have any—*they do!*"

"Gravity bombs!" gasped Spencer, as the typical glow of the gravity-energy bomb became visible. "We've no defense!"

The glowing field of concentration energy was followed by half a hundred more, speeding resistlessly toward them. "Wrong," said Aarn, "we have. Watch." The gravity bombs came nearer—entered the *Nova's* own anti-gravity field, then the magnetic field—and as they entered it, they twisted momentarily into a strange, distorted sort of glowless glow, a paradoxical, eye-twisting elongation, and—ended up as magnetic bombs. The magnetic bombs promptly dissolved in the magnetic atmosphere. "Motto: Never put off on the other fellow what you can't take yourself."

The stream of bombs stopped as the Seeset saw them vanish, harmless. The *Nova* retreated abruptly.

"What have you learned?" asked Mart Toral anxiously.

"Three things. No battleship you have can even stand up beside that. We couldn't stay too long, because he could just work us down, eventually. We can't even scratch his skin at present. None of our regular weapons can touch him. Yet we've got to do something quickly, because I'll bet planets to asteroids they've got another one of those underway—probably with improvements.

"Now I know one way—but I don't want to use that. I wonder if they developed that anti-gravity themselves or captured a ship?"

"They captured an investigator," admitted Mart Toral. "They were all ready for it—we didn't guess it was a trap. They had a room made quite openly—and lined it secretly with a network of wires. Held a conference in there. Several. We smuggled an investigator in—and they turned on the current in their wires so that the machanism was completely and totally paralysed. We couldn't destroy it."

"Ah—that's a relief. Bound to happen sooner or later. I was afraid they might somehow have invented it themselves."

"Now what was that you didn't want to use?" asked Spencer.

"Something I couldn't take," replied Aarn. "I can't see any way to stop it now. I've tried it, and it can't be stopped. Passes through resistium, with destruction of the metal; a Myryan collector won't touch it; and even the invisibility isn't any good. Can't use that." Cornal loomed ahead. "Anyway, the planetary transpons can stop even that monster."

"What is it that will destroy even resistium?" asked Carlisle in surprise.

Aarn smiled. "I've got it installed in this ship right now," he grinned. "Emergency. I haven't the slightest intention of using it against the enemy for the excellent reason that I can't handle it from the other end. Right now I could cut that Seeset ship up as though it were made of cheese. I know he hasn't a thing that would stop this. BUT—*I won't use it because he might turn it right back at us.* If he found a defense, and we didn't, he'd wipe out the Tornan fleet in less time than it would take for him to get from Cornal to Darak."

"Sweet Satellites! What *is* it?"

Aarn grinned. "I'll show you the thing in action." The *Nova* turned, and raced faster than light across the vast solar system to Planet Seven, a fragment of rock a hundred miles in diameter, revolving at a distance of tens of billions of miles from Torka, so far out that even in the great explosion Seven would remain cold and frozen. Minutes passed, before Aarn located the tiny pebble in space. Then it loomed a mountain of jagged, broken rock, and streaked metal.

"I'm going to use this thing way out here, because the Seeset probably aren't watching, and if they are they couldn't analyse it at this distance. But remember, Mart Toral, I'm not going to use this, save in the ultimate extremity. It's too dangerous."

The *Nova* was pointed toward the barren rock. "Watch," said Aarn, "it will last only one and a quarter seconds."

For an instant the scene existed on the screens. Then the

man saw it only in memory—and written in the blasted rocks. A column of blue, pearly light, opaque and swirling, visible even in space, a column twenty feet across that looked solid, yet swirling like a milky glass pillar rotated swiftly, reached down from the *Nova* to the planetoid. For a second and a half the column lengthened, and in that time pierced the mass of rock and metal, while the *Nova* seemed suddenly to reel away from the little body. Then it was over.

The planetoid had a neat, slightly oval hole bored straight through it. The sides of the hole were polished and smooth, but yet they were ragged and pitted. The pitted surfaces were smooth, and glowing dull red. No great amount of energy seemed to have been expended. Yet—floating off across space was a vast, spreading column of gas, glowing faintly in the light of distant Torka.

"You might at least tell me how it defies your principle that the thing is more deadly to the projector than the target. How do you start it if you can't stop it? What's the projector made of?"

"Resistium bus bars," Aarn called mockingly, "that would vanish in that beam in something under a ten thousandth of a second. Now shut up—I'm working on something else. Something I *can* stop."

Spencer opened his mouth, and shut it with a click. He looked sour. "Mart Toral," he demanded, "will you tell me how in blazes that man could install so big a piece of apparatus as that must be without your men even knowing it was there?"

Mart Toral shrugged, and laughed. "Our physicists followed with interest the development of a new weapon Aarn was installing. It was a radio-interference device for projecting interference that would de-control enemy torpedoes. They thought it was a new type crumbler ray. Aarn was so far ahead of them that they never knew quite what he was doing—and if he particularly *wanted* to keep the thing secret—!"

CHAPTER TWELVE

"DO YOU NOW HAVE THE PENCIL crumbler ray too? Do you think it will work against them?"

"No," replied Aarn. "The Seeset believe in my motto."

"Then they have a defense. What's the other weapon? Am I now to be informed of its exact operation? I take it, it's some sort of ionic gun."

"At length," grinned Aarn, "you are. Carlisle may know more."

"I saw you install that water tank, and the heavy water. From past experience, I would say you have ideas of using neutrons somehow."

"Right. Deutrons really. The silent bullet! Unstopped by electric, magnetic or gravitational field. Only slightly influenced by the ordinary momentum wave field—such as the Seeset are using."

"Will it pierce ten feet of beryllium armor?" asked Spencer. "That sounds like a mighty big order—and beryllium is a light atom."

"It's plenty of opposition—but we have plenty of power."

"So," said Mart Toral sadly, "have they? That other ship you mentioned has appeared. It is the *Torka.* All our ships have been grounded, save the power-ship maintaining the transpon beam to Torka itself. That has not been molested. It was attacked just once, and the full power of the main transpon turned on the *Darak.* Her transpon shield wouldn't carry all the energy of a sun, and besides the wasted energy was spilling out in all directions so fast that the walls were red hot all over when it

left. We can do nothing—and they are rapidly building more of those ships, I am sure. Sooner or later they may break down the defenses of that power-ship. Then we will be nearly powerless. Our little photo-cells would be practically useless. We have charged all the aggie coils on the planet, however."

"How soon will your weapon be ready?"

"Another two days, I believe. The work is not easy. But—I promise the work will be highly satisfactory. This is an unusually nice weapon—for you."

The first day passed, the fifth since the *Darak* had appeared. The two Seeset giants hung off Cornal grimly, traveling always together. They were very evidently waiting reinforcements now, waiting till they could combine to cut that thread of power that flowed in from Torka. That was too hot for even these two super-ships to attack, but—they had hopes.

The second day came, and passed. Aarn was not ready. This apparatus, hastily constructed, must yet be constructed with an exactitude that permitted the safe handling of two and a half million volts—with all the lashing power of a straining atomic generator behind it. One small arc—a path established—and some five hundred million horsepower would gleefully rush along the pathway created.

A supply ship, especially equipped for speed, started out from Cornal that day, carrying a complete set of apparatus for installation in the power satellite to make it capable of defense against the Seeset ships. Except for Aarn's neutron weapon, this power planet was now a fully equipped battleship.

The third day, Aarn was ready. The *Nova* started up from Cornal. At ten miles from the surface it hung, Aarn watching the two super-ships interestedly. "Not merely sister ships," he mused, "but Siamese-sister ships. I've got to pry them apart somehow. Look at 'em—hanging up there watching us. If they thought they could stand the heavy transpon defenses here for even a minute—.

"But how in blazes am I going to pry 'em apart? I can't handle them both."

"They probably aren't exactly alike, Aarn. Remember, even sister ships, made to the same plans, are always a *little* different. These ships probably have some different ideas incorporated in them?"

"I suppose," said Mart Toral hesitantly, "we could use a part of the fleet as a decoy to draw off one ship, or to so engage their attention as to make it possible for you to handle them."

"They'd handle several thousand of your men," replied Aarn, shaking his head. "We could, no doubt, destroy the ships then, but only with the loss of hundreds of lives. That is an expedient we will not use. It is even more ultimate than my ultimate weapon. I will use the ka—the other weapon first.

"There is one—possibility—I could—try." Aarn looked thoughtfully toward Mart Toral. Finally he turned to his radio apparatus, manipulated it, worked it, and finally picked up a succession of garbled sounds, the Seeset in the battleships in conversation.

"Can you make it out?" Aarn asked Mart Toral.

"Certainly. They've been speaking in straight Seethani ever since those new ships were developed. They use a code with the old ships, but that was usually broken down within a week or two. They don't even bother with codes anymore," he added bitterly.

"Straight Seethani—then you could speak it?"

"Yes—with a perfectly atrocious accent. My vocal cords aren't made the way theirs are. They'd recognize it in an instant."

"Ah—that's the question. Now we shall see." Aarn's face was brighter with hope. Rapidly he gave his instructions to Carlisle, who went back to one of the *Nova's* storerooms, and returned with two pieces of apparatus brought from Myrya. Rapidly he connected them up with the power outlets below the control board, and at Aarn's instruction, set them up. Carlisle donned a headset, Spencer another.

The *Nova* rose. Out of the atmosphere she shot, and the instant she was beyond the Heaviside layer, Aarn went into action. He first sent out a powerful—but not too powerful—beam of

broad radio interference. On every wavelength from the end of the infra heat to the most enormously long, Aarn maintained a washing, roaring magneto-electric disturbance that sounded like the roar and crackle of south polar static. Instantly the Seeset ships were striving to get into communication again.

Then Aarn sent out a far more powerful fan-shaped wave of interference. The two Seeset ships were perhaps fifty thousand miles apart, and now the thin fan cut directly between them, a heterodyning frequency that completely disrupted their communications.

Mart Toral began to speak into the Nova's ultra-powerful transmitter in a low slurring voice, Seethani, mushed and blurred beyond recognition almost. The static Aarn was setting up completed the job of mushing it—*but did not completely stop it!*

Simultaneously Spencer and Carlisle were hard at work. Their faces were blank in deep concentration, their eyes dreamy. Tiny tubes glowed in the Myryan apparatus.

Majestically, the gigantic *Darak* turned away, and shot speeding toward the distant planet for which it was named. The *Torka* hung motionless where she was. Gathering speed under terrific acceleration, the *Darak* was indistinguishable in space in three seconds. For forty seconds more Aarn waited. Then slowly he started toward the *Torka.*

"He's coming back," snapped Spencer.

The *Nova* flashed ahead at her maximum acceleration. In three seconds she was beside the vast bulk of the *Torka,* and enormous streams of concentrated energy bit at her savagely. The crumbler ray flamed blue-violet on the resistium shell, while the air inside the ship whispered and rustled with the anti-momentum beams. A titanic tractor gripped them as the anti-momentum died almost instantly. The transpons aboard the *Nova* roared under the strain.

Aarn sat motionless at his controls, watching a tiny, newly installed instrument. The nose of the *Nova* pointed directly at the vast prow of the *Torka,* but slowly it was sweeping backward. The light beams of the *Torka* remained fixed, stopped

following the *Nova's* motions. Then the tractor beam slipped off, and stayed away.

The *Nova* was pointing at the last eighth of the *Torka's* vast length as the *Darak* exploded into view. Aarn turned the *Nova* toward the *Darak* unconcernedly forgetting, it seemed, the *Torka.* Her beams continued to burn into space. Undirected, wildly.

The *Darak* attacked with the fury of a tricked man. She had been tricked, and her commander knew it now, knew and attacked with the desperate hate that followed.

The nose of the *Nova* pointed toward his great ship, and as the *Darak* turned her savage energies on the tiny craft, the *Nova* hung apparently listless, turning slowly. No beam, no energy responded. Only a slight rippling cone of glowing light passed slowly the length of the vast ship, and where it passed, the beams seemed to grow fixed and rigid, immovable. The cone of glow reached her tail, and the *Darak* moved on as aimlessly as the *Torka.*

Aarn turned a powerful tractor on her. It was scarcely opposed. No pressor beam pushed it aside, and slowly the mighty bulk of the ship turned from her wild plunge toward Cornal, and twisted into an orbit, her rays still flaming.

"It's done," said Aarn quietly.

"They're all dead!" gasped Mart Toral. "I didn't expect—quite that."

"Only light elements affect neutrons particularly. Beryllium stopped a lot—but not enough. Animal protoplasm is made up almost entirely of the lightest of elements, and particularly—hydrogen. Those enormously high-velocity deutrons I sent were stopped by the beryllium only partly—and neutrons went on. Many of them got through the beryllium walls. Very few of them passed the living protoplasm, so rich in water and hydrogen. No living creature could stand the flood of neutrons that was sent. The ship couldn't be stopped—but the Seeset aboard her could.

"The rays may burn for another day or so. They probably have tremendous storage capacity aboard her. Then they will fail,

and the magnetic atmosphere and momentum waves will fail, and your ships can enter. In the meantime, have some battleships come out and take charge of them. You will be able to learn every secret of the Seeset from those ships. Everything is in almost perfect condition—save for the Seeset aboard her."

"What effect did those Seeset feel from the telepathic devices?" asked Mart Toral curiously.

"You sent a message, their ears heard something, an indistinguishable garbled sound. They only recognized it as Seethani, but the telepathic devices were simultaneously sending them instructions. Their minds and ears worked together to make them believe they were getting real information. The *Darak's* commander thought he received a message from patrolling battlecruisers nearer Darak that a ship like ours was heading for Darak. The *Torka's* commander thought he was getting orders from the commander of the *Darak* to remain where he was and handle this ship, while the *Darak* handled the other."

"How did you guess that the commander of the *Darak* would have the right to order the *Torka* to stay here?"

"Precedence. The *Torka* and *Darak* were sister ships—more or less. So much so at any rate that the man who was given the *Darak* would probably keep her. But the man who got command of the *Darak* would be given it by right of precedence. The *Darak* would be the ship of the highest ranking Commander, probably the highest in the entire force, since there were no other battleships, and most of the battleship commanders had been killed previously."

"Why not use the telepathic devices alone?"

"Would you believe an order that suddenly popped into your mind out of nowhere? You'd want to know how come. Well—it actually popped into his mind, but he thought he was hearing it."

"We will continue our work as planned?" asked Mart Toral.

Aarn nodded. "And keep a very close watch on Darak. I'd suggest you learn where those super battleships were made, and do something to make that particular spot uninhabitable."

CHAPTER THIRTEEN

RANLOR WAS GIRDLED AT LAST BY the fleet of over-powered cruisers, battleships and supply craft. A transpon-beam ship was there also, maintaining a gigantic beam to Torka, relaying her power through hundreds of smaller beams leading to each of the ships on Ranlor.

They began functioning now, all of them. All their stored energy, and all the energy they were drawing from Torka went into the operation. Slowly a terrific anti-gravity field developed about Ranlor, and simultaneously the planet's orbit shifted more and more toward Torka. Astronomers were kept busy calculating the shifting forces as the anti-gravity field offset the planet's weight, and the combined power of the great ships turned the little planet toward the sun, using her own orbital speed as a driving force.

Day after day the process went on, billions of horsepower pouring in constantly. The planet was cooling now, under the protecting Myryan collector beams that sheltered the ships. Week succeeded week. At the end of three weeks the path of the planet had been turned till it was headed directly for the heart of the gigantic, pulsing disc below. Simultaneously news came from Cornal that the Myryan collector rays were all installed for the protection of the cities. Another month would be required before the electrolytic devices were finished.

At the end of four and a half weeks, the fleet left Ranlor. The *Nova* and two astronomers' ships remained on the runaway planet. Her surface still glowed with fierce heat, and above loomed the gigantic blue-white disc of flame.

She was rotating now, for the first time visibly, for the tidal action had long since damped her axial rotation till a year and a day were the same to her. Now, headed directly toward Torka, her rotation became apparent. Incredibly jagged, harsh rocks of the night side were shifting and cracking to fall in colossal, soundless slides.

The last ships left, and returned to a changed Cornal, a world prepared to survive the exploding of a sun. A world tensely waiting.

Darak, on the contrary, was a seething mass of Seeset, rioting and killing. There were some ships left, and the riots were about these. The ships had been overloaded, crowded, and the favored Seeset had taken off for one of the four tiny planetoids that revolved at tremendous distances from Torka. They hoped survival might be possible out there.

The planetoids were being hollowed out by crumbler rays, and lined with a thin, air-tight metal wall. Perhaps, in the four planetoids, a tenth of the population of Darak could be crowded.

The plates Aarn had captured from Dar-tan had been examined, catalogued, measured, and compared with the Terrestrial plates. The problem had been solved finally, and Sol had been located, a faint, barely visible G-O star nearly three hundred light years away. The *Nova* had been prepared, and loaded for her long trip, but Aarn delayed his departure waiting to see the last catastrophe.

Ranlor approached her doom with what seemed to be majestic slowness. Gradually her temperature mounted, from a dull red to an orange, finally white, and at last blue-hot. She became a mass of seething, pressing gas, but while bound in the terrific anti-gravity field the Tornan ships had set up about her, she could not expand. Vast tongues of flame reached out toward her, licked hungrily, fell back. Unhindered, Ranlor marched on. A dark spot against the incredible heat of Torka she burrowed her way in. Ten—twenty—fifty—a hundred thousand miles. Then the black spot vanished, and a titanic sun-spot appeared. Somewhere far below, the cold, icy planet was absorbing energy from

the incredibly hot gases and chilling them to such low temperatures that they ceased radiating in the near X-ray, and cooled to ultra-violet temperatures as their electrons fell back into orbits. A terrific, sucking collapse was going on. Still the tremendous energy of that anti-gravity field held Ranlor together.

"That field," said Aarn, "won't break down till Ranlor has reached the active heart of Torka. Ranlor is terrifically denser than those gases, and her momentum will carry her deep, while the condensation of stellar matter on her cold surface will keep pushing her deeper and deeper, making her larger and larger. Eventually that field will open out and Ranlor will explode."

The fourth day, the regular pulse of Torka had changed. It was fluttering, rough. The fifth day, it reached a peak, fluttered there momentarily, then the radiation increased again slightly. By the seventh day the rate of increase was terrific. Torka was expanding visibly. It was brighter now than before, and even bluer. It increased at an appalling rate, a speed that represented a terrific explosion within a star. Faster than sound waves ever moved, the explosive force was plunging out from Torka's heart. Hourly they could see the change.

The eighth day, the prominences began to show the terrible explosive action. They began to reach out thickly; then the bases of the prominences moved up, and only the rapid expansion of those tongues of flame kept them from being swallowed. Moving at nearly three thousand miles a second, the titanic flames reached out toward Marnol, planet Two. Evidently the attraction of the planet was drawing them onward. They stretched, and the whole sun expanded.

On the tenth day, Marnol was touched by the flame, and instantly the entire atmosphere of the planet flared up. In fifteen minutes Marnol was lost in a flame three hundred thousand miles wide, and fifty thousand thick at the tip. The flame bent, broke from Torka at the base, and closed in on Marnol. In twelve hours a second had started toward it, and the first, cooling and contracting, had made Marnol a ball of molten rock and metal no longer five thousand miles in diameter—but forty-five thousand!

It had been turned from its orbit by this acquisition of mass, and was falling obliquely toward Torka as the second flame hit it.

Two days later the flame, an even greater one than the first, retreated toward Torka. Marnol was gone, part of the streaming matter that fell back toward the rapidly expanding Torka. Already the surface had reached the orbit of Ranlor.

Darak was a dead planet. A thin mist still swirled about her, a mist composed of the vanishing seas, seas boiling furiously on the hot rocks. The vast forests had disappeared in thin flames, almost smokeless, as the superheated air combined with the superheated wood. The ground was smoking now as the humus in it oxidized. There were no rains, only the stupendous, steady evaporation of the seas. Terrific winds whipped and tore at the smoking surface. The smoke had stopped along the equator by the time the rushing winds and vast, swirling clouds of vapor from the vanishing seas of Cornal made vision impossible from the planet. Instead, a faint glow became evident.

Torka stopped expanding just beyond the orbit of Ranlor. Then it began to grow hotter and hotter. The swift expansion had cooled it to an almost yellowish state. Now it was heating again to a bluish color as the terrific forces deep within it sought readjustment.

Cornal's seas had vanished, when Aarn decided to leave. The experiment had reached its final stage, and Torka would burn thus for years before finally sinking to its new, stable state.

"Your cooling systems are working perfectly," he told Mart Toral, "you are comfortable—more so, I think, than while the Seeset were attacking you. At any rate, you are established. I have another duty to perform—so I must leave for home."

They left from the cooled, sub-surface city where the *Nova* had been made. No ships were venturing outside unnecessarily now. A great crowd of Tornans watched them leave through the airlocks, and vanish, faster than light, into space.

"And what," asked Spencer, "is the duty you mentioned, other than that of getting so important a citizen as myself back on Earth where he belongs?"

"Getting so important a citizen as Anto Rayl to Earth, instead of lost in space the way we were. He said they'd be making a trip through from Magya to Earth in a year. Do you realize that eight and a half months have passed? I have to make calculations from Earth, go through to Magya, and warn Anto Rayl and give him corrected data."

They approached the Solar System at a speed less than that of light, on their momentum wave drive. Somewhere between Neptune and Uranus a slim, swift ship met them, a ship some eight hundred feet long, a good third smaller than the *Nova.* It was a glistening steel hull, and on its bow was the designation *"I. C. C. 256".* Below that was the insignia of the Interplanetary Council.

A radio beam on the Standard Communications Channel came into the speaker of the *Nova.* "Halt for investigation, by order of the Interplanetary Council. What ship, and where from?"

Aarn smiled gently as he flipped a tumbler over. "Brother, this ship is the *Nova,* and it's from so far away I couldn't even tell you. I happen to be Aarn Munro, accompanied by Russel M. Spencer and Donald G. Carlisle. We tested out the first momentum-wave ship, and, as you may remember, didn't come back. I see somebody else tested it out—successfully. How long have we been missing? We've been where time doesn't run the same way."

"Spencer—Munro—Carlisle—" gasped the voice at the other end. Abruptly it became sharp. "Impossible. They died three and a half years ago."

Aarn chuckled. "Come on home, and we'll tell the Commander."

The *I. C. C. 256* was suddenly clutched in a combined tractor-pressor beam that had been designed to handle such things as Seeset super-battleships. A rotating magnetic field spun it around in the direction of Earth, and the two ships flashed forward.

Aarn's gray eyes twinkled with slumbering humor. "I wonder what the *I. C. C.* made out of it?"

The cruiser abruptly started fighting. Transpons lashed out angrily at the *Nova,* and flared against Aarn's defense conductor shield. "You couldn't soften our outer shell with a toy like that, even if I let you touch it," Aarn informed the cruiser gently. "Try again." Several forms of material destruction rained on the *Nova.* Most of them stopped dead in the outer magnetic wall, but one type, evidently equipped with neutralizing devices, slipped through, and exploded violently—and harmlessly—against the resistium wall. A heat ray followed, radio frequency energy. Aarn neutralized it.

"Pretty good, Captain. But really — old Earth would be rather hard put if the fellows we've been playing with paid a visit. Now take that planetoid off there," said Aarn, taking it on a tractor beam. "In the first place, you need better transpons." The planetoid exploded into incandescent gas under Aarn's beams. "Second, you need some bombs of a different sort, a gravity bomb for instance. Let's put that back together, Spence." A gravity bomb exploded in the region of the gaseous planetoid, abruptly sucking the flying molecules back to a sphereoid again. "Then again, one of these space-cups would eat up anything you've got." A Seeset space-cup floated out, green and malignant, and vanished with a huge mouthful of the matter. "I'll even show you my best weapon."

The milky opalescent ray reached out for the tenth part of a second, and the planetoid was a clear shining gas cloud in space, that not even a gravitational bomb would have been able to recondense.

"In other words," Aarn finished, "we're friends, and mighty glad to see you and Earth again."

BOOK THREE

THE INFINITE ATOM

PROLOGUE

ZHI ATHRON LOOKED ANXIOUSLY toward the western sky. It was forbiddingly black; in all the expanse of the western, northern, and southern skies there were only two faint, clouded stars, and one planet's point-like disc—and the ever-present, ever-menacing meteors. There were five luminous trails in the sky—seven now—twelve—four—but always some. It would be almost impossible to spot the moving light of the ship for which he watched.

Before him on the field loomed the great dull-gleaming hull of the expedition ship, silvery in the light of the countless clustered stars in the eastern sky, where the Black Nebula had not yet wiped out light. A long line of slaves was carrying smaller crates of supplies into the ship; a few were operating handling machines from which dangled huge boxes and barrels of food.

"Web Thorn still has ten minutes," said a low voice behind him. Zhi Athron swung around to see the dim outline of Tha Yory, the Chief Engineer. "He will use all ten, I suspect."

"He will," smiled Zhi Athron, "poor fellow. Shalmar Aien will be hard to leave—for twenty-five years."

"It seems unjust. Shalmar Aien is his mate and his love as truly as any free-born wife might be—but simply because she is a freed slave, he was eligible for the draft."

Zhi Athron ran his fingers through his stiff, iron-grey mane and nodded. "But it is necessary. Everyone who disliked the duty could find a slave to claim as wife if they allowed that. Twenty-five years is a long wait—but less than a twentieth of

an average lifetime. I have seen nineteen such periods come and go. Four hundred and seventy-seven years."

"Was the world much different then?" asked the younger Chief Engineer dreamily, looking up to the bright sky in the east.

"Not vastly, really—or yet, I suppose it was. The Black Nebula has spread so slowly through the years, blotting out more and more sky, that we cannot remember its spread. When I was born, only the west was dark. The sun was not quite so hot then, either. There were seldom more than two meteors in a minute that were visible. Conditions change so slowly—"

"I wonder if the end will come before my death?"

"No one knows. The sun's direct gravitational sweep reaches out half a light-year into the Black Nebula to draw in those iron particles, and the concentration that causes, spreads the disturbance another half light-year. Billions of tons of them falling into the sun every day—each so minute it is scarcely visible to the naked eye. Millions of tons of them will fall on the planets every day when we pass into the heart of the Black Nebula. The sun will grow in mass, and burn hotter; the planets will grow in mass, and slow down in their orbits as they swing through the resisting medium. In the end—all will unite in a single great luminous sphere. Sometime, perhaps it will be stirred again—and a new planetary system born. But in the meantime—we had best seek another system.

"Are the supplies about in—we leave in an hour."

"Yes," grumbled the engineer. "Look at it—twelve hundred feet long. Half a million tons. We get our power by transpon beams tapping any sun, so we carry no fuel. We drive it with momentum waves, and don't have to carry rocket discharge mass. We rectify the air, and use it time after time; we recover water, so we need no great water supplies. And *still*—I can't carry a decent supply of spares. And I'll need 'em. Look at the gang of theorists I've got to work with! Astronomers I'll have to rely on for navigators. Physics research scholars for electricians. Chemical geniuses for rectification technics. Two laboratory me-

chanicians for repair technics. Watch that crew wreck stuff—and no spares to replace them with. Great spaces—and we plan to go as much as 25,000 light-years from home!"

Zhi Athron smiled. "Sorry, Tha Yory. It cannot be helped. Our ships long ago explored everything within two thousand light years. We know that for planets, we must have stellar near-passages, and these occur only where star-fields are dense, near the heart of the galaxy. To make twenty-five thousand light-year ranges, and explore all the stars we must, twenty-five years are a minimum, as you well know. You can cut down the foods, and have more spares—but what good is a fine ship to dead men?"

"I know—I know," groaned the engineer. "But they might have given us more real spacers, and fewer theorists."

"I agree on that," admitted Zhi Athron, "but the Rulers probably considered things, and of the seventy-eight expeditions that have gone out, seventy-two came back on time."

"This expedition *won't,*" said Tha Yory. "I know it." He lapsed into grim silence.

"Web Thorn is about—" Zhi Athron froze suddenly. A deep roaring siren started; it mounted—mounted—and the higher it went, the darker became Zhi Athron's face. Higher—a titanic meteor on the way—higher—then at an almost inaudible pitch it broke with three short shrills of sound.

"The west—" he gasped. "Web Thorn is due from the west—" Zhi Athron looked off toward the dim western sky—a moving light—then all was lost in a sudden growing, fierce glow, a tremendous glow beating straight toward them—a titanic, exploding flame that began to throw off heat. All the landscape was lighted till the field and the ship and the great construction sheds loomed bright in its glow. The far mountains even were lighted!

There were shouts and cries from the slaves who had been loading the ship. They were racing for shelter now, the last few cases of supplies dropped heedlessly. The roar of transpon beams going into action came from the lock of the ship, the anchoring

tractor beams played out abruptly as Zhi Athron and Tha Yory ran suddenly for the ship.

The heat was terrific now, unbearable. It scorched their broad backs as they ran.

A titanic, world-rocking explosion threw them flat to the ground as the very planet trembled. The heat grew even more fiercely burning, the glare became blinding. There was a new sound, a shrill, screaming roar, a vast wind in the making. Dull lightnings began to play from swift-gathering clouds.

Bruised, the two rose to their feet, and started on. Then the ground heaved horribly; it rocked, and cracked before them. The roar of a crumbling building echoed, and the fierce glare died for an instant, to return, dull and red. Then the wind. Painfully they regained their feet, and started toward the ship, looming dully red ahead of them now.

A cold, fitful breeze snapped around them. Far away they could hear the dull moan of a rising gale. Another gust caught them, snapped angrily at their faces, blowing Zhi Athron's grey mane straight out from his head. Tha Yory was making slightly better time than the older Zhi Athron. In the dull red glow in the west, they could see the great timber lands bow suddenly in a wave, a wave that sped toward them at terrifying speed, with a mounting, bellowing roar. Giant trees snapped with the crackle of a string of Titan's fire-crackers, to leap into the rushing air and tumble off across the country in a wild dance.

Zhi Athron flung himself to the ground a second before the wind hit. Tha Yory ran on—and tumbled suddenly backward, rolling wildly with threshing arms and legs as the wind toppled him over, and struck with an explosion of appalling sound. A torrid, blistering gale lashed them mercilessly. The turf underfoot shrilled in a strange high protest as it shifted and moved, invisible fingers clawing the soil out from the roots, and twisting the grasses away in thick clouds. Grimly Zhi Athron reached forth his two powerful arms and set his legs into the soft ground, as Tha Yory came hurtling back.

He caught him, and was nearly dragged away with him

before his Chief Engineer had settled himself. Then painfully they forced their way toward the lee of the great ship, rocking now in the mighty wind despite its tractor-beam anchors. A construction shed somewhere to the west shrieked as timbers parted, rose in the air, and flew straight toward the mighty metal hull. The crash as it struck echoed for the briefest fraction of a second before the wind snatched it and the flying timbers away, high over the heads of the crouching figures on the ground.

"I told you—" roared Tha Yory, his voice drowned out by the wind, and snatched from him before the words left his mouth, "this expedition—was doomed—" Zhi Athron couldn't hear. He labored heavily forward.

The wind was growing hotter, painfully hotter. In it now was stinging smoke from flaming forests. A sudden gust, even more violent, laughed at Zhi Athron's weight of nearly seven hundred and sixty pounds, hurling him fifty feet before he again clutched the turf, and labored forward. Tha Yory waited for him, and they joined hands.

They were gasping and smarting when they reached the lee of the ship. The going was harder here, for the wind was turbulent, not a streaming roaring current. Rain fell suddenly, torrentially, a hot rain that rasped their skins like grains of sand. They were bruised and scratched, bleeding in a hundred places when they entered the lee of the ship—and fell gasping for breath in the semi-vacuum behind the quivering, straining craft. Not a scrap of clothing remained on their bodies; only here and there a stout metal or leather belt still held.

A lock opened, and they climbed into it hurriedly. In seconds it was closed, and normal pressure of sixteen pounds returned. Zhi Athron ran swiftly to the control room, his face clouded. He heard a radio report as he entered. "—nage of 75,000. It landed about 85 miles west of Tharcool Spaceport, one hundred and forty east of Dargath. Timber within a radius of thirty miles is aflame and—"

Zhi Athron tuned it out as he threw the dials over. A call went forth, insistent. Another—for thirty seconds he called, then

listened for thirty more—thirty seconds of calling—"He is dead," sighed the old Captain. "Web Thorn must have been struck almost directly by that vast thing—"

Tha Yory was behind him. "And we leave in thirty-five minutes. We'll have to signal at once for another First Assistant."

Zhi Athron shook his head slowly. "No," he decided, "that would be useless, and—cruel. Shalmar Aien has lost her mate—to the Expedition she thinks. He is dead—uselessly. Besides, we could not get another First Assistant in this time. We must go without one."

Tha Yory groaned. "Out of forty men, one is dead before we start. And that leaves only seven spacers—seven capable space workers. Well—it would be cruel. Another good spacer would die in this ship. This ship is *never coming back.*"

* * * * *

Space about the ship was studded with stars, thousands, tens of thousands, more than the eye could comprehend. And directly before them, a greenish star shone blindingly brilliant

Nar Arlon looked at it with scowling face. "That," he said at length, "will make the seven thousand, eight hundred and fifty-seventh star we have investigated. Not counting long-distance investigations, and excluding doubles and variables, giants and dwarfs. Eleven and a half years of this travelling faster than light—rushing through space from star to star. A brief hectic period of glare and examination, search and study, then another dash to another star for more examination, and another charge of power to reach the next sun. Eleven and a half years away from home. My eldest children will be mated by now. With children of their own. And less than half this course is run."

Zhi Athron looked at his First Assistant steadily. "Not necessarily, Nar Arlon. It may be that this star will be the one that will send us home at the limit of our speed, with the news that a planetary system has been found, a planetary system to which your children and your children's children can move and live out all their life-times in safety."

"Yes—and perhaps to find, when we get there, that the ex-

pedition that came in the year we left brought the news, and that those children and those children's children are already safe and busy on a new planet."

"Has Bar Scorth sent in his distance calculations?" asked the Captain, changing the subject.

"Aye, sir. We will reach planetary distance in about an hour."

Silently Zhi Athron nodded, and went back to the power room. Tha Yory was working over the small lathes on one side of the room, with a laboratory mechanician, and with much cursing.

"You imbecile—you sub-normal idiot! Can't you see that is a *reverse* pattern? Can't you remember that what is a projection here is to be a countersink in the metal? Ahrrrr—teach me—teach me how to work that machine that I may teach you your craft. Must I not only make the patterns, but make the metals too?" Tha Yory stopped as Zhi Athron appeared smiling.

"He finds the work more difficult, Tha Yory, because he is used to working from pattern-drawings."

"But the blundering error of Nature can't cut from pattern, and I can't draw plans, and neither can any one else around so far as I can see."

"What part is it? Have we had so many breakdowns as to exhaust the spare parts list?"

"No," replied Tha Yory, "but like any good engineer when I have a crew that doesn't yet know the difference between the theoretical limits and the factor of safety, I intend to keep up my store-room—such as it is. I'm working on some other spares, too, some that were too big to carry, when we started, but can now be carried in the exhausted store rooms."

"Ah, then that is why you swept in those tons of meteoric material when we stopped at that star back there," Zhi Athron nodded. "What in particular are you aiming at?"

"Spare high-speed apparatus. We have only five different parts for that—and if we had an accident that smashed it, and the machine shop too, we'd be lost forever. If it happened be-

tween stars, unless we have a supply of metal a lot bigger than we have, we'd never return to home.

"And Zhi Athron—I feel it—every day I feel it—*we're never going home.* But I must keep trying."

"It is foolish, Tha Yory, to think that. For eleven years you have been saying that—and nothing more serious than a cracked cylinder in the air rectifier has menaced us so far."

"There are thirteen and a half years to go," Tha Yory replied, grimly returning to his blasphemy of the mechanician.

"We are nearing another sun, you know, Tha Yory. Be prepared for action as directed." Zhi Athron returned to the control room.

In an hour the sun had grown to proportions that made it give an appreciable heat in the ship. At perhaps two billions of miles the ship was slowed, and the speed dropped to far less than that of light, perhaps a thousand miles a second.

Then the astronomers and physicists got busy. In moments the dozen or so instruments the ship carried were focused on the star. The rotational velocity was determined, the distance, the spectral type, the temperature of the surface, and finally they trooped to the control room with their readings. The ship's great engines were needed in the next tests, the final tests. First, the gravitometer hook-up was arranged, the ship's anti-gravity field varied, and plottings made, then finally the momentumometer was activated.

For five busy minutes the mathematical machines worked—then a sudden, incredulous cry of joy went up. The star must have planets of large size! The rotary momentum of the sun was scores of times what it should have been, had it alone been registering.

Frantically they went to work with the instruments, and in another twenty minutes nine planets had been located, as well as indications of some sort of other planetary body, or additional swarm of planets.

Voices chattered—buzzed—chortled in glee. A planetary system had been found! Of all the expeditions, they perhaps were

the first! With intense concentration the physicists and astronomers went to work with the gravitometer and momentumometer and the telescopes. These were the best instruments for charting the orbits, determining the mass, and so forth. Next would come actual visits to the planets in turn. Then—*home!*

They settled to the plane of the ecliptic of the newly discovered system, and they drifted there, with their momentum wave energies at work in the momentumometer, their anti-gravity coils that freed the ship of a sun's pull, cut out. And only the magnetic shield spread out about them, for all eyes were intense on the data being discovered. An instantaneous, incredible flash—a snapping crack sharper than any rifle's crack—a roar and gush of air—the clang of bulkhead doors.

Utter silence fell. The chattering, joyous voices died in sudden horror. A stony meteor—

"A stony meteor—" gasped the chief Physicist, "a stony meteor—no metal—went right through the magnetic screen—no momentum wave field, no anti-gravity field—" A roar of voices broke again, dull and horrified. An accident—destruction at their moment of triumph—

"Silence!" roared Zhi Athron's great voice. "Silence, you fools. Listen to me!" Silence fell slowly, a low muttering wailing persisting. "Now—Bar Scorth, the emergency suits. Thon Ralt—the pumps. Test the accumulators, Scol Rano." Zhi Athron was already at the control board. With a sweep of a mighty arm, he shoved aside the startled scientists. Two hundred years in the Interplanetary Service had fitted him for emergencies. A practiced eye ran over the instruments, and in a moment his mind interpreted them.

Bar Scorth appeared with an emergency suit. Already the air was thinning as the great pumps sucked it into the storage tanks. Zhi Athron struggled into the suit, then with two others of the basic spacer crew, ones who knew space technique, he was at the power room bulkhead. It was closed. Here was the puncture.

The door opened protestingly as Zhi Athron took the con-

trols. Thinned air rushed shrilling out through the two gaps in the power-room walls. Three motionless figures lay on the floor, and with a gesture, Zhi Athron stooped to one of them. With the aid of another suited spacer he was carried swiftly to the fore quarters; then the others were brought. The bulkhead slammed shut again, and the four spacers were in the airless power room while the scientists fell to work on the unconscious ones. In minutes the three were beginning to move again, uninjured by the brief period without air to breath.

In the power room Zhi Athron fell to work. Under his directions, the great patch-plates were fixed in place. A hand transpon projector was hooked into the main power-storage lines, then a blazing pencil of incandescence welded the patches in place. In two minutes the bulkhead doors were reopened, and air allowed into the sealed power room.

"Where's Tha Yory?" demanded Zhi Athron.

"Tha Yory—I saw him—go out," said a gasping voice. "He was standing near the path of the meteor—the air—swept him out!"

Zhi Athron groaned. "Our only practical engineer! Come—you physicists now, you will have to tell us the damage done."

He knew pretty well himself. He could see the apparatus, and the almost clean round holes the meteor had made. Travelling at almost 1000 miles a second it had smashed through those mechanisms so cleanly that only fused, rounded edges remained. It had crashed through an egg-shell thin glass tube, and made a neat, smooth-edged hole. But—it had crashed neatly through the high speed apparatus, and through the momentum-drive control.

The physicists reported that, and one additional fact. The meteor had been broken; a chip perhaps, slowed so much in ripping its way through the outer ship wall, the inner hull, the various storage room walls, that, its speed almost spent—it fairly exploded in the anti-gravity coil!

"Then," said Zhi Athron grimly, "we have *no* power?"

"None," replied the physicist.

"Well, we must restore the momentum drive first. Come."

It was easily said. But while there were spare parts, while these physicists knew perfectly the theory of the momentum wave drive apparatus, while they had even been working with it for the last eleven and a half years—they had been working under the able direction of Tha Yory. And Tha Yory was not there. Not for nothing had Zhi Athron spent two hundred years working space liners. But even with his help it was a poor job they did. And there were no spare parts for the speed drive, and there was no such thing as a spare anti-gravity coil—a spare coil thirty feet in diameter!

Miserably they tried out the momentum drive. It worked, worked enough for the needs of the moment. The ship was slowed, and they started for a planet, the third planet out, where temperatures and living conditions might be bearable. Some seventy-five hundred miles in diameter, their astronomers had estimated it, about five hundred less than their own, but the astronomers admitted their data was poor, and probably somewhat inaccurate.

The ship handled fairly well in space; and not until they drew near the planet did they fully realize their loss in not having the anti-gravity coil. The ship was riding in on the momentum wave apparatus, apparatus designed to drive it with lashing accelerations a million times as great as the acceleration of a planet's gravity.

And worst of all, they had made some slight slip, some slip they could not find, and there was an inefficiency in the apparatus, perhaps ten percent—but when half a billion horsepower are needed, then ten percent means flaming arcs of fifty million horsepower. They had placed grounds to handle the leaking currents, but the grounds glowed white hot in moments, and the heat stifled them. For not more than twenty seconds at a time could they operate the drive. In surges, they slowed their ship, and in surges they maneuvered it to the planet.

Then came the task of making a landing with their horribly defective apparatus. Zhi Athron himself handled the controls, but the astronomers calculated poorly, and the gravitometer and

momentumometer were no longer available. They neared the planet with a speed still approaching thirty miles a second. Desperately Zhi Athron drove the momentum waves into action, but the heating forced him to ease it. The first thin traces of the atmosphere were cold and yet heated them, but at Zhi Athron's order, the power room was cleared of living beings, and only the inanimate machines were left. The room was thrown open, the locks and the sealing plugs pulled free. The thin, keening blast of an incredible wind swept in—wind that was almost a perfect vacuum, yet screaming through at thirty miles a second. It helped to cool the power room, and Zhi Athron could use more power. They swept around the world, slowing more and more, as the ship was able to drop lower, where denser air cooled more swiftly. But even so they were limited. Zhi Athron turned the ship downward. As he maneuvered desperately, the chemists worked swiftly with the air, trying to determine its characteristics.

"Hydrogen—free hydrogen and oxygen in explosive mixture," reported the Chief Chemist. "There must be plenty of oxygen, at any rate, to find it so high."

Zhi Athron said nothing as he continued slanting downward. Instruments told him of internal heating in his apparatus, that the air-blasts could not cool. The speed was still a mile a second, as they dropped to a level where the air resistance acted like a mighty brake. A flash of dull-green-grey water shot beneath, followed by a vast silvery cloud bank. "Breathable air!" a chemist called.

"Open all ports," snapped Zhi Athron. A new, stronger blast of air came in, air that was thin, and bitingly cold, carrying strange, wet odors, and strange, spicy smells. A natural air, not the re-breathed air they had inhaled for the past eleven and a half years.

They shivered in its blast, then suddenly they were blinded and wet and cold as the ship plowed into a vast mass of cloud. Zhi Athron's face grew taut as he applied braking power, blindly. The ship slowed more, and a warming heat began to beat out at them through the closed bulkhead of the power room. A sonic

altimeter was started, and Zhi Athron read it with distrust. What were the sonic properties of this air? It showed an elevation of three miles—and that was not enough for safety. Desperately, he applied power that brought the ship to a sudden halt. And simultaneously there was a terrific roar from behind. The patched machine failed completely, as, with startled eyes, Zhi Athron saw the altimeter needle hanging almost over the zero mark. He tensed his powerful body, and bent his knees for the shock—

The breeze of their passage had ceased as they stopped. Now a new wind started, and the clouds began to rush past them again in billowing masses. For an instant they cleared, and rain, torrential rain, beat down about the ship—and below loomed great jagged boulders! With a world-shaking roar, half a million tons of metal and glass and insulation struck the solid granite rocks. The ship flattened, and split like a rotten fruit.

Twenty-two figures crawled out of it. Zhi Athron led them, his small surviving troupe. The five remaining spacers behind him, the scientists miserably trailing. They looked back at the ship. Through pouring rain, they saw half the great thing broken and split on their level, the other half completely torn from it, and on a lower level, fallen over a cliff.

"The artificial gravity discs worked to the last," sighed Zhi Athron. "They saved some of us."

"Night is coming," said one of the astronomers, in a hopeless voice. "Can we find some shelter and warmth in the ruin?"

"How long is the night here?" asked Zhi Athron.

"I don't know—about the same as ours, perhaps a little shorter, some nine hours to ten hours."

"Does it always rain?"

"No—it should be much like our climate. Though one cannot tell, for we have deserts where it never rains, and tropics where it rains every day. But—will we find any warmth in the ship?"

Zhi Athron looked the hulk over carefully. "The forward power-coil storage bank should be intact. Perhaps we can find some heaters."

They searched through the ruined ship, and gradually gathered necessary things. Three of them climbed down precariously to the rear half of the ship, and with ropes and cables, hoisted a stove and some cases of foods to the main group above. There were charged coils, and heaters, and one room with only a slight crack in the ceiling. The adjacent room, too, was in good condition. A transpon-handset was found, the partition cut out, and welded over the cracks. The stove was set up, and a meal prepared. Night had fallen now, and still the rain beat down, cold and wet and dreary. Lightnings flashed off to the south, illuminating in brief outline the wild crags of the mountain on which they had landed. Only two unbroken light-tubes had been found, and these glowed dimly in the huge metal room.

The hours of the wet, dreary night passed, and at last, as faint light began to filter through the clouds, the rain ceased. A wind sprang up, cold and moist, and the clouds scudded by overhead. Then breaks began to appear, the clouds became patchy with lighter and darker spots.

When dawn came, the sky had cleared, and the disc of the sun was visible as it rose from the land below them, distorted and red. The land turned green as the sun crept higher, the sky gradually becoming a deeper and deeper blue, and the warm rays of the sun slowly dispelling the chill of the night.

The twenty-two who greeted this first dawn on a wild and inhospitable, an utterly strange world, were a disconsolate, hopeless group standing beside a cracked and broken ship that had brought them across countless light years of space, to land them at last, alone and utterly without hope of return. Only bare, craggy granite was about them. Below, a trackless forest.

Then—something stirred! Something near them, and they turned with a start to see a strange creature disappear around a point of rock. Instantly five of the younger ones were after it, before Zhi Athron's warning could stop them. They rounded the rock at a gallop, to see the strange creature fleeing down the mountainside with an agility and speed that defied them, till at last he came to a gully, where the broken, but more level ground

permitted them to overtake him. A strange creature, that turned on them savagely—*with a tool—a weapon!* Swiftly two of them disarmed him, and captured him, to carry him back to the group above that were watching him.

A strange creature! It had but *four* limbs! Two hands, quite normal, quite like their own, on arms quite like their own, but the body was a straight, oval cylinder, and was supported by but *two* legs, legs almost exactly like the arms, but for their greater length, and greater strength and size. The head was almost exactly like their own, rounded, with two eyes, one nose, straight and small, a mouth, two ears, one on each side of the head. The face was a perfect replica of their own! But it had hair only on the top of its head, not a mane extending half down the neck to the shoulders.

Zhi Athron stared at the creature. "What manner of thing is it?" he gasped. "It must be intelligent."

"It is," exclaimed one of its captors, "it had a sharp metal blade—bronze, I take it." He wiped a long gash across the side of his trunk as he spoke, from which blood was beginning to flow. "And he has clothes, and probably other tools."

"Were there others?"

"We saw none."

"Ayhu—set him on his feet that we may see him, and stand beside him."

Side by side they stood, Yal Dorn, and the creature of this world. Seven hundred and fifty pounds Yal Dorn weighed, his weight distributed on his four powerful legs, with their absurdly tiny feet—incredibly fleet feet, though—feet that would carry him a mile in thirty-five seconds when he wished, his fore-trunk curving upward in a powerful arch to support the massive head, and the broad, muscular shoulders. His chest, between the mid-limbs, was deep and wide, his horizontal back, between the mid-limbs and the hind-limbs, broad, and rippling with smooth muscles. Beneath the loose-fitting clothes, the hair on his back lay smooth and glossy, a rich brown. From the ground to the top of his head he stood some five and a half feet.

This strange creature was, beneath his clothing of some rough, stinking, half-tanned leather, completely hairless, or very nearly so. He stood vertically on his hind-limbs, balancing evidently with wonderful dexterity.

"Amazing!" exclaimed Rath Duro, the biologist. "He is evidently developed from an entirely different line of evolution. Why, I wager that this four-limbed type goes back through all their evolution to the earliest fishes! See how simple it might have been—suppose that the fishes had developed not six, but four fins on our world. Then, when they crawled out on land, instead of six-legged creatures, there would have been four-legged creatures. So simple a difference—"

"But how can he walk? Think—when he runs, half the time he must balance on *one* foot! And with fifty percent of his motive power continually out of service, he could not possibly make speed enough to escape his enemies."

"You think so?" laughed Yal Dorn. "I tell you, had there been more of this mountain, he'd have escaped us. His agility in among those rocks was beyond belief!"

"Exactly," exclaimed the biologist smiling broadly, "I am sure he must depend on his climbing ability. See, with the light weight—he cannot weigh more than a hundred and fifty pounds —and the prehensile hands *and* feet—he could climb through a tree with agility that would save him from any greater animals."

"But his feet aren't prehensile," objected Yal Dorn, "he couldn't hold with those short fingers."

"No matter—he is intelligent now. No doubt his early ancestors did."

Zhi Athron shook his head slowly. "He is an amazing creature, at any rate. Such a spindly thing. And such great clumsy feet!"

"He probably can't run fast," a physicist commented. "With those great heavy feet on the end of his legs, the pendulum action would be so slow that—Look."

On an adjacent rock, another creature had appeared. A creature that was white, and heavily haired, a small creature some

three feet high, and equipped with a pair of sharp horns. Instantly Yal Dorn was away after it, and a half dozen others. They stopped within a hundred yards as they gaped open-mouthed at the little animal. If the captured man had been agile—the goat had wings! He balanced on rocks less than four inches across, leaped to others a score of feet away, and ran on the level at a speed that nearly equalled theirs.

A roar of laughter recalled the chagrined hunters. "Not all these creatures seem so slow," laughed Zhi Athron as they returned with dejected faces.

Their captive decided this was his chance. This time he went up. He scaled a rocky wall with an abandon and skill that defied the efforts of the heavier Centaurs. In seconds he had topped a rise, ducked behind a rock, and was out of sight.

Zhi Athron looked after him with some sorrow. "He was at least intelligent to some extent. We must somehow establish contact with these creatures if we are to do anything."

* * * * *

Most of the apparatus had been cleared out of the machine-shop-engine-room, and the machines set up again in one of the repaired rooms. An office had been established for the physicists, and an observatory for the astronomers. A score of the barbaric men were toiling nearby, under the directions of one of the chemists, erecting a furnace wherein metal could be melted down, while another score or so worked at a casting bed. Four Centaurs were working over the drawing-tables in the office.

The skill Tha Yory had discounted, and cursed, was being put to use now. These laboratory mechanicians who were so poor at cutting out his patterns were at work on the pattern-drawings of the physicists. And the physicists were at work converting their calculations, and the data the astronomers gave them into pattern drawings. Zhi Athron was at one side, talking to a young barbarian. His stinking hides had been removed, and replaced by some clothes made from a cut up Centaur's garment. There was little for Zi Athron to do now. He had finished his report, the astronomers and physicists were working on theirs.

And off to one side, half a dozen Centaurs were hard at work on a cylindrical metal thing, their hand transpons glowing in white-hot needle beams. Slowly a ten-foot long torpedo was growing into being under their hands.

Zhi Athron left his place as a call came from one of the astronomers. A technical bit that required the advice of the old space-ship captain.

At last Zhi Athron moved on to the group of physicists.

"Do you think you will be able to do it?" he asked at length.

"Certainly. It is only a very delicate instrument. Ah—we could use Tha Yory now, but for all his complaining at our inefficiency as spacers, I think he would admit this was something to prove our worth!"

"Yes, he would. Tha Yory was just in his appraisal. And—" Zhi Athron looked toward the dismantled hull of the broken ship "—he was not so far wrong, I am afraid." Zhi Athron looked toward the broken metal for some moments. "Have you calculated exactly how long it will take?"

The physicist shrugged. "Impossible. It is a question of power. The greater power available to build up the speed-fields, the greater speed will be obtained. We cannot tap this sun for power, through this thick atmosphere. We have only the power left in the storage coils. Already more than six months have passed, and that power is slowly, inevitably leaking. And four banks of coils were ruined. There is an outside limit to our power, and in the meantime, we must draw on that power for these transpon welders, for the cutting machines—and for the casting operations. I cannot tell how much we will have. If—if, I say—all goes well, the ship should be able to make the trip in fifteen years. A return rescue ship could cross the space in five days."

"Hmmm—then at least fifteen years will pass? Not too bad, however. You are all young, and I am so old time means little to me. How long will your construction work take?"

"We are rushing it—it should not require more than a year, even with our crude tools."

"The Ah-kaan slaves are not helpful?"

"The Ah-kaans are useful for heavy work. No more," replied the physicist casting a scornful glance at the laboring men about the slowly forming melting furnace.

"They have intelligence, sharp intelligence and sharp minds. It seems they have nearly as keen a mind as ours, save that it has never been trained, never stimulated. That young one I was speaking with—I will spend some time with him. Perhaps I can teach him somewhat of science, and learn from him more of these strange creatures. Certainly, when our people do come, these Ah-kaans will be useful slaves. In many tasks they might serve better than slaves of our own race. They are lighter, and more agile."

The old Centaur trotted slowly away. The soft rasp of the metal-cutting tools came to him, as the delicate parts were cut out. It was a great task. He himself would scarcely have conceived it possible to make a machine, self contained and self powered, capable of guiding itself across the thousands of light years of space to the home star. A star so far away that it was actually invisible! But the astronomers and the physicists had convinced him they could do it, and laboriously he had written out his record of the trip, enclosed the metal sheets of his log, and sealed them in the metal cannister they had provided him. He was keeping a further record of these peoples now. He would send that too, when the time came.

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The air was cold, bitterly cold, and the soft white of the snow trampled and grayed. The welcome heat of the melting furnace was comforting to old Zhi Athron as he watched the men and Centaurs working about the great pot. Hundreds of pounds of silver were being melted, to be cast into billets, and drawn into the wire they needed for the speed-coils of the little ship. It was complete now, all but this. It had taken eighteen months, not twelve, and they had seen winter come, cold and wet, and give way to the heat of summer. And now winter was back. They no longer used the radiant heaters of the ship for

warmth. They still lived in the metal rooms, protected in part by their insulation from the cold. Small charcoal fires supplied heat now. The coils were being rigidly spared. Every watt of energy would be needed.

Old Zhi Athron looked on, and kept out of the way. They were working at top speed, for melting this metal, and keeping it hot and liquid required thousands on thousands of watts of energy, and every second meant a horrible drain on their coils.

The metal had been stripped from the ruined coils of the old ship, broken, jagged pieces, pounded by the slaves into billets that would melt more readily. It was chemically pure silver, and must not be contaminated by the gases of charcoal fires, otherwise they would have used them.

The metal was glowing white now, and Zhi Athron watched the scintillating stream spurt suddenly from the tap, into the prepared billet-molds. Instantly it was grasped by tongs, and slung to the waiting drawing machine. Before it could cool, it had been drawn down several sizes. Thereafter it would be cold drawn.

The low, sharp commands of the Centaurs made little sound. The sputtering and roar of the transpons that sent their blasting heat into the metal made more. But slowly a sharp-voiced quarrel disturbed Zhi Athron's concentration. He looked up. Two Ah-kaan slaves were quarreling, bitterly denouncing each other. These Ah-kaan males were so given to quarreling. Zhi Athron started around the great furnace to stop them. Suddenly they were fighting, striking, wrestling. One of them was a great brute of a man, the other smaller, sharp-faced.

And abruptly, with a shout of rage, the great brute charged. The little sharp-faced man was clever. He had been egging the stolid brute on to that charge. With incredible agility he sprang aside, ducked—and the larger man stumbled forward, a cry of horror on his lips as the great white-hot pot loomed near—a shrill scream of terror and agony on his lips as he plunged over the low rim and into the molten mass!

Instantly there was an eruption of explosive violence, burn-

ing, white-hot metal shot out as the man's body was converted to steam. Two Centaurs went down screaming as ten-pound globules of the white-hot stuff sprayed over them. And the rest stood frozen in horror. Then a dull moan escaped them. *The silver was useless—contaminated!*

The sharp-faced man trembled as he saw their hard, intensely angry eyes. He streaked away screaming for mercy as three of them came after him.

The heating transpons were off when they brought him back. They stayed off now, for this silver was already contaminated and useless, and, very slowly, they were contaminating it further, to the tune of his screams, and the protests of Zhi Athron.

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It was hot summer, and the merciless sun of Thessaly was beating down on the laboring women. Fifty of them. Fifty young women swinging their clumsy hammers rhythmically. Two Centaurs were standing guard over the pathways up to the mountain-side camp. There were small transpon-pistols in their hands, and a wary look in their eyes. The Ah-kaans had resented fiercely this taking of their women, and the slaughter of nearly one hundred of their men in the process. Old Zhi Athron had protested against it too, but he had lost his control of these Centaurs, young and intensely angry, completely independent of him now that the ship was wrecked, and they were the only ones capable of helpful action. They listened to him as an experienced philosopher and practical guide. But—there was one ghastly fact. New silver had to be taken from the wrecked ship, carefully cleaned and scraped, pounded up, and melted. Melted with the infinitely precious energy of the coils still left them.

Quarreling, bickering men they refused to trust again. No more were they kindly in their treatment of slaves, as they had been. It was a harsh, heavy-handed discipline they enforced on these captive women now. So much as an angry word among themselves, and both were instantly shot through with a white-hot needle of a transpon pistol. The women, they had found, were less quarrelsome. So young, strong women did the work.

But they had to maintain sentries now, for the men circled angrily about the camp, seeking always a chance to sweep in, kill a Centaur, or steal away one of the women.

Zhi Athron's face was lined anew now. The young Ah-kaan in whom he had interested himself was the only male in the camp now, a subdued, frightened male, who made the situation more real to Zhi Athron every day.

And now, Zhi Athron knew, he would never again see the home planet, Eaon. "That finishes it," Kal Pola had said, as the chief Physicist looked into the ruined pot of metal that day when the petty quarrel of two slaves blasted their hopes. "We must melt another potfull."

"The ship couldn't make the trip now?" asked Zhi Athron.

"It could. It can. But it will take nearly one hundred and fifty years at best, now. There will be barely enough power to establish the speed fields; surely not enough for really high speed. In three months we can melt new silver, and protect it, and build the coils. Then," he had added bitterly, "sit down to wait for half a lifetime—two hundred years—more than 70,000 days—for that message to get home and return.

"We will do it. Nothing else is left."

Again sufficient silver was ready to be melted. New silver. Some of it was being dumped in the pot already. The slaves were carrying it over, sweating under the sun. Zhi Athron saw a woman stumble, jostle her neighbor, and receive a dark look. Someone else saw too, and a whip sang through the air to land on the naked body. Zhi Athron winced at her cry.

* * * * *

It lay completed at last. The clear light of the half-moon lay silver and limpid on its rough metal walls, and the bright stars shone down on it. The bright, strange stars. Eighteen Centaurs, and sixty humans looked at it as Kal Pola and Kwal Tass made final adjustments. Hars Forth was reading slowly from his tables as the image of a star moved slowly across the hairlines of the television screen.

Kwal Tass straightened slowly, and only Kal Pola remained. Finally he too, stood upright, a dangling cord in his hand. He carried it over to the television screen, and watched closely as the slow-creeping star image moved toward a tiny dot of crossing hair-lines. Slowly it approached. Then—it touched. Instantly he pushed a tiny button, and suddenly the ten-foot messenger ship was rising, the dangling cord loosened from the socket. It rose straight and steady, then turned, and swiftly gathered speed. In seconds it was invisible. Slowly the Centaurs turned away, wandered off together. There was an air of hopeless dejection settling on them, a languidness that afflicted the physicist as he gathered up the few remaining instruments to take them to the ruins of the ship that was their only home.

Zhi Athron approached him, took some of the apparatus in his arms. "How will they find that when it does reach the system?"

"Automatic radio," replied Kal Pola listlessly. "Start broadcasting when it reaches its destination—within half a billion miles of the sun. Broadcast on the emergency band. Somebody'll hear it. Keep it up for thirty hours. They'll find it. In one hundred and forty-two years." He laughed, a harsh, explosive, bitter laugh. "I shall then be two hundred and twelve—if I'm still alive. Half my lifetime gone."

"Suppose—suppose they have left the system then?"

"They will not have. If they started to move the year we left, it would take three hundred years to finish, and there would be observers there so long as the system endured."

Kal Pola walked slowly, listlessly. There was all time before him. And nothing more to do—nothing but wait. Wait one hundred and forty-two years for rescue from this barbaric world of savages.

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Zhi Athron topped the rise slowly. His muscles were growing very stiff of late, and he welcomed the help of the grey-haired human at his side, the young Ah-kaan he had made his companion forty years before when they first landed.

It was seldom he came up this mountain now. It was a hard climb for the white-maned Centaur, five hundred and thirty years old. And his former companions did not love the sight of him. A sentry called out to them as they neared the rusted metal walls, a sentry with a thick, slurred voice, speaking the Ah-kaan tongue.

"It is I, Chiron," replied the old Centaur, in the same language. His voice was clear, and a bit sorrowful. The one who stepped into the fuller light of the full moon was scarcely recognizeable as the young Kal Pola of a short forty years before. His face was sagging, and blotched, the face of a Centaur nearer four hundred and fifty, than one hundred and ten. And the eyes were blood-shot and angry. The strange foods and drinks of the Ah-kaans, introduced by the slaves, had wrought ruin to the crew. Alcohol. The chemists had known it as ethyl hydroxide. Here, they had found that a natural life-form produced it, and that the natives drank it with enjoyment. A taste—and another. It was no mere stimulant to a Centaur. It was a deadly drug, a thousand times more potent than to a man. Kal Pola's face and his flabby, lack-luster coat told the story. These Centaurs had dropped their clothing in the summer, as did most of the natives, and now the moonlight fell on a blotched, dull coat, where there should have been sleek sheen of youth and health.

"You have changed, Kal Pola," said Chiron sadly.

"And you, old fool," replied the one-time physicist. "What do you want here?"

"Something you have no use for. Some books. I want the ship's medical handbook. The son of my friend here is learning surgery, and chemistry. I think he may help these Ah-kaans. I have heard too, more and more persistant rumors of a far higher civilization to the south. Are there none who would aid me, and accompany me?"

"None," snapped Kal Pola. "Get your books and leave. And you might tell your Ah-kaans that we need five more slave women. If they send them—well and good. If not, we must come after them."

The old Centaur made his way across the rocky plateau. It

was strewn with rusting metal. Here and there the broken remains of some instrument lay. The ship was fast rusting away. It had been made of steel, for steel was strong, and all too plentiful in the Black Nebula. And good enough, for a ship intended to spend its time in the airlessness of space.

He found the book, still in the cabinet, locked and sealed against air and moisture. The main library was missing, or soaked to a useless ruin by the rains, and the slowly eating natural acid formed in every lightning discharge.

Sadly Chiron made his way down the mountainside, aided by his grey-haired companion.

"They were young, as my race goes, and the wait of one and a half centuries was too much for them. That, and your alcohol. I shall not see the return of the rescue ship. And I am sure none of them will. It is better so, perhaps. They would be dangerous to the people of my world, in their condition, and with their tales of the strange drinks they have found."

* * * * *

There were only two mourners beside the raw earth mound. A cold rain was falling, and the others who had aided in bringing the heavy body here had left at once. There were twenty-one other mounds, older than this one, and behind a mass of rusty metal, barely discernable as a structure different from the iron-reddened rocks.

One of the two was grey-haired, the other a young man in his prime. The elder looked at his companion slowly. "You broke his spirit, my son." The other nodded slowly. "I know you thought only to aid in the conquest—aid in the advance. But he taught you your skill in chemistry with another aim. It was not, to him, a weapon, but a healing agent. That you should think to use it to evolve that inextinguishable fire—

"He taught your grandfather, my father, as a lad, he taught me, and he taught you. He hoped the teaching would spread. He knew our people to be intelligent, but he was wrong, I am afraid, in thinking they wanted to use that intelligence in difficult ways. One hundred and eight years ago, he landed on this moun-

tain, and all that time he has spent in seeking to help us. It was too much that you should turn his help to a weapon to hurt.

"And his companions had died, hated and despised by all, so that only we would listen to him.

"You have taught the secret of the Inextinguishable Fire to your generals, but now teach also the knowledge of medicine. And to your children, teach the story of Chiron, that, when the time has passed, they may give Chiron's Record to the ones who will come."

They returned down the mountain, the young man slowly, and in genuine sorrow deeper than that of his father, for he was to blame for this death of Chiron, alone and hopeless in this foreign world, where all but a scant half-dozen looked on him with hatred and suspicion.

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The young man grew old, and his children learned the story, and they grew old, and taught what they remembered of the story to their children, but those children in turn did not pass it on very carefully, for there were great stirrings, and the old father had been wrong. The Time of the Coming had passed, and no ship had come out of the void to reclaim the Record of Chiron. Besides, the Achaeans were sweeping south, and the Inextinguishable Fire was sweeping the more highly civilized Minonans before them. Gradually the Achaens were to settle, and mingle with the Minonans, and the Dorians were to come after them, and mingle in turn, and the Greeks were to arise. And the Inextinguishable Fire to be known as Greek Fire, the only surviving trace of Chiron's teachings, the one whose release brought about his death. But in time, even it was to be lost, to be rediscovered for a brief moment centuries later by Archimedes, and to burn a Roman Fleet, attacking the Greek city of Syracuse on Sicily.

Then, beyond that, only the ancient tales of the Centaurs, half man, half horse, and of Chiron, the tutor.

* * * * *

Dor Starl bent closer to the radio speaker to make out the

faint signal. Finally he turned, and called Garth Shoal, a younger, keen-eared Centaur companion. "Garth Shoal—come, I believe I hear an emergency call!"

The trotting feet of Garth Shoal came swiftly nearer. "What? An emergency call? But—we are alone in this section of space now—the last ship left nearly two years ago, and the relief is not due for four." Hastily he went toward the instrument and listened carefully. Blurred, almost unrecognizable above the static caused by the swarming, minute meteorites as they struck the magnetic field of the ship, they could hear an emergency call. Hastily, as the alarm bell began to ring, Garth Shoal took over the instrument, and set it for directional readings. Carefully he took down the angles, then the ship leaped forward for half a million miles, and again angles were taken, then at right angles to the former course, another hop of five hundred thousand miles was made. Other Centaurs were appearing now, half-dressed, hastily donning clothing. Their voices, loud in demands, hushed swiftly as they heard the incredible news. Silently they watched as Garth Shoal took his third reading. Already an astronomer was busy with the calculators working out the exact angles, as the observatory ship plowed swiftly through the swarming meteorites in the general direction of the calls. Softly the astronomer gave exact data, as Dor Starl maneuvered the ship more slowly, and Garth Shoal listened. Steadily the signals were increasing in strength. Presently they were clearly audible. Garth Shoal gasped as the signals became more legible. "Spirits of Space—it is expedition Seventy-nine! They left Aeon one hundred and forty-three years ago — three years before Fifty-two brought the word of the discovery of the Malcan System!"

Half an hour later, the Centaurs were searching space with drawn faces. They must be near the ship now—the signals were strong. But Garth Shoal said they were weakening in clarity now, the ship's power was failing. So near—and yet they could not detect the ship's fields! "They cannot live if their magnetic shield fails. What can be the trouble—why can't they tap the sun for power?" asked the worried Dor Starl rhetorically.

"Look—*there*—we've passed it!" The instrument man cried out in startled amazement. " Their field is *tiny*."

"Back—seek it," snapped Dor Starl.

But it took them nearly ten minutes, even when they were near, for they were looking to find a great twelve-hundred foot exploration cruiser, and the ship they found was a tiny thing, not over eleven feet in length! Carefully they caught it with a tractor beam, and pressed it slowly through their magnetic screen. The signals stopped almost as soon as it struck their screen, the last dregs of power drained in fighting the screen of the greater ship. Carefully they drew it into the lock, and as the door closed on it, all but the two watches trotted in.

Dor Starl stopped them, as a slow, steady hissing came from the metal shell. Then gradually relieved he went forward. "There cannot be a living being in it—the air was hissing *in*. It has evacuated to space. Records—data—the story of their disaster—"

The hatch was quickly found, a raggedly cut trap that fitted badly, a trap intensely cold, that was condensing moisture and carbon dioxide from the air. A mechanician opened it carefully, and two physicists looked in. Slowly they whistled in surprise. "Beautiful—wonderfully fine mechanism—guided itself automatically across the void to this system—"

An astronomer joined them, and looked in at the tiny, delicate mechanisms of silver and machined steel and glass. "Beautifully fashioned—beautifully. Look—the message cannisters!"

Carefully they were taken out, and the mechanicians aboard the observatory ship cut them open with delicate metal saws. The sheets within were carefully extracted—

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Dor Starl looked back across space with some feeling of sadness. He was only two hundred and seven himself, so the old system had not been so deeply rooted in his mind as it might have been. But still—

The sun he looked back toward was a far different star from that which had shed the first light his eyes had seen. It was immense, a blue white giant, radiating with fierce intensity, a

great lop-sided sun, already dimming behind thousands and tens of thousands of light-hours as the ship fled on, out toward Tosk, and the star of the new system, Malc. Dor Starl's fifteen year vigil beside the collapsing system of the old worlds was ended now. A new crew in the relief ship would watch for perhaps another five years—

But Dor Starl felt well satisfied, for he had many records of immense value, not excluding the immensely important document signed by Kal Pola, and the log of Zhi Athron. Another planetary system available! Not, he decided, immediately important. The entire race had been busier for the last century and a half than any Centaur had ever believed possible. First—the news of the discovery of the Malcan system, with the planetary system of Tosk—Sor-osk and Al-osk. Then the suddenly immensely heavier meteor bombardment beginning within a decade that forced the vast change in plans. Where they had planned to move gradually, principally by a process of non-reconstruction of buildings on Aeon, and a slow building and immigration to Tosk, due to this sudden increase in meteors, the orderly retreat had become a wild rout. Ship after ship staggered into space, loaded to the maximum. Ship after ship raced across the twelve thousand light years to Malc, and then back again, and ferrying loads of people one way to return empty. People, records, machines. Laboratories and factories. Whole buildings had been cut loose, supplied with momentum-wave drives and speed-fields, and moved intact. Everything was done in a mad scramble—families separated—records scattered and misplaced—no one actually knew how many ships had been lost en route.

But Dor Starl felt sure of a welcome. The two new planets, each large as Aeon had been, were far from crowded, there was vast work still to be done before any thought of further colonization could be entertained.

But a relief ship must be started at once.

It was only seven days later that the observatory ship edged into the Malcan System. Malc shone small and red, a weak little star, as stars go, of spectral class M-5. It was of magnitude plus

10, one seven thousandth as bright as the star reported by the ill fated expedition that had sent back the message torpedo, but highly satisfactory, for there were two planets, toward which the ship was heading now, that revolved at a distance of only one and a half million miles from the surface of the sun, two planets, like a Titan's dumb-bell with gravity as the cross-bar. Eternally facing each other, 7500 mile Sor-osk and 8100 mile Al-osk rotated around each other once in twelve hours at a distance of thirty thousand miles. These twin worlds of Tosk were the Centaur's new home.

The observatory ship landed in a great space-port on Al-osk, the capital planet, near the new, raw city of Aeon, named in honor of a planet that was no more. Aeon was growing swiftly—in the fifteen year vigil spent in the old system, great changes had taken place that were readily apparent. There was still about it an air of helter-skelter building fever. A delegation of scientists came to meet the ship, but even their time seemed short. Dor Starl was rushed off in charge of one group, his Chief Assistant in charge of another. The precious message cylinder was turned over to the proper authorities—

And because Dor Starl's duty in relation to that message cylinder had been properly executed as promptly as it was possible for him to execute it, and because he had vastly interesting and important data of his own in regard to the final collapse of the old system as, bloated with the billions of tons of meteors, it had fallen together, and because he was vastly busy attending to the interpretation and working out of these data, Dor Starl, not unnaturally, left the message cylinder, and the necessary steps it demanded, in the hands of the proper authorities, and quite forgot the thing that had happened, anyway, nearly four years before he returned to Malc and Tosk.

And the proper authorities, because they were exceedingly busy straightening out important and tangled files, and because the clerks whose duty this message was were very heavily pressed, they filed the metal sheets very correctly, and sent the correct form of notices to the proper higher authorities.

And somewhere in those passages of notes among proper, and heavily over-taxed officials, they were checked off as attended to, and dropped into the receptacles provided for messages whose provisions had been met.

And within forty years of the death of Zhi Athron, no living mind in all the Universe remembered the fate of the expedition that had crossed space and had been disastrously successful in finding a planetary system.

* * * * *

The representatives of the Toscar Government of Al-osk hurled angry, threatening words at the rebellious Sor-oscans.

"The Pioneer Fathers," thundered Shar Talkon, "established the old government in the new worlds. And they established it on Al-osk. To claim for an instant, to merely hold the thought, that Sor-osk should be the seat of the government of the worlds is rebellious, anti-social—"

"And sensible," interrupted Kwal Zenth bitingly. "Sor-osk is the obvious seat of the worlds government. The Pioneer Fathers were no doubt great, we do not deny it. But the greatest of us is sometimes caught in a hasty error. And if he truly is great, he will attempt to rectify that error. The Fathers knew that Al-osk is the larger world—and so established on it the capital government. But—Al-osk is *not* the larger world in practical fact—it is two-thirds water surface, while Sor-osk, though smaller in diameter, has a far greater useful land area. Further, when our peoples moved, in the vast work that was to be done, and done quickly, they established themselves on the lighter world where work would be eased to that slight extent at least. As you well know, at the end of the first century after Aeon, Sor-osk had a population of 553,000,000; at the end of the second century A. A., the population was 890,000,000; and now, in the sixth decade of the third century A. A., the population is 1,200,000,000. And today the population of Al-osk has risen to only—four hundred and eighteen millions. And still you say that the mistake of the pioneer fathers, the mistake they made in their haste and vast workings, should be perpetuated forever!"

"It was not a mistake!" roared Shar Talkon. "They saw in Al-osk not the present values, but the future, the permanent values. We have water. We know it. It is our great asset. Water —plenty of water. It makes every mile of our planet fertile. We can support today a population twenty times the population you boast—" Shar Talkon rumbled on.

His speech had little effect, for already, on Sor-osk, the Soroskan Government was forming, and the officers being elected, and the way being laid for a century of bitter commercial and economic feud that split the Toscar race in two for all time, it seemed. Then followed a century of waning bitterness, as a new generation rose that accepted the division, and the others grew slowly to accept it.

When five hundred years more had passed, Sor-osk and Al-osk existed alone and independent of each other, but friendly heirs of the same tradition.

When 1000 A. A. came, a thousand of the years Aeon had known, and the Toscars still used, they combined in a great celebration, the five and three quarters billions of Sor-osk and the four and a half billions of Al-osk.

Two thousand A. A. came, and again a great celebration was held, by the two friendly worlds, one of fourteen billion, seven hundred million, and Al-osk of thirteen and three-quarters billions.

Thirty-five hundred A. A. came and passed. But now on Sor-osk, a population of twenty-nine billion Toscars struggled for existence, and on Al-osk, there were but fifteen billions, living comfortably. The ancient science of the Pioneer Fathers had been forgotten to a large extent, after the great building was done, while the newly established Toscars fought to consolidate their holdings. There had been little interest in outside affairs, such as astronomy, and pure physics and chemistry. They had fallen into a gradual decay as the more important and immediate aspects of life loomed suddenly larger. For two thousand years a slow decline had taken place, till a level of comfortable life was reached. The machines the Toscars needed existed, and were

improved and simplified, so that no trouble was experienced. For a thousand years this had been maintained, with the slow, slow growth necessary for bare maintenance of knowledge.

The Toscars had never taken kindly to records made orally, written records were so much more readily studied. The oral records had fallen into disuse, almost with their invention. And the inevitable slow changes in language had worked havoc. The metal plates and sheets that had been common in the days of Aeon had given way to the more easily inscribed chemical sheets, an opaque, flexible material of an organic nature, derived from plants, durable, tough, but easily marked with simple dyes. Scientists had warned against it. Philosophers had criticized it. And the people had used it. The scientists had foreseen the result accurately. Three thousand five hundred years had passed. The metal sheets endured, permanent and strong, legible and easily handled. And no one in the Toscar system could read them. In three thousand five hundred years, slow changes had crept into the language, slow changes that had made the Toscar of Sor-osk learn a new language when he wished to speak with the Toscar of Al-osk. But worst of all—the intermediate records, on the perishable paper-like material, had vanished. They had the original language. They had the end-product. But they had no means of tracing back the changes. And—no one particularly cared, in 3500 A. A.

But Sor-osk was beginning to care. Al-osk hung eternally in the skies. Commerce went back and forth, and the crowded, underfed Sor-oscans labored for the scanty products that they had. Al-osk had, centuries before, limited her population well below the saturation point, and her people were well-fed, happy, and had room enough. Further, had they been able to read the speech of old Shar Talkon, they would have agreed that Al-osk's water was no great menace, for every square mile of Al-osk was a garden spot, well warmed by a sun that to them, now looked white.

Sor-osk began sending immigrants to Al-osk. And Al-osk began putting on restrictions, since their population had a fixed

level, and if Sor-oscans were admitted, Al-oscans had to stop having children.

Sor-osk began quietly investigating the old science, and slowly means were worked out to penetrate the age-old murk of language change, and forgotten science began to emerge. Al-osk, not being stupid, also began to do a little investigating.

Perhaps the Sor-oscans were more earnest in their search. Perhaps the Al-oscans were not as sharp-witted, since life was easier on their world. In 3597 A. A., Sor-osk started a war with Al-osk, and in 3597 A. A., the war was over—after three days. Two and one half billions of Sor-oscans migrated to Al-osk in the next five years. In 4024 Al-osk started a war with Sor-osk, having learned very well the lesson of studying the ancient science, and added the idea that the ancient science was not all there was to be known, with the result that several hundred Sor-oscan cruisers, the entire Sor-oscan battleship fleet, and one Sor-oscan city vanished in a beautiful opalescent beam. In eleven months, two and one half billions of Sor-oscans migrated hastily back to Sor-osk, and elbowed their way into the crowded planet. The wars had been some help, however, since nearly half a billion people had died in the combined total of eleven days they had lasted.

Maybe that appealed to the Sor-oscans. They found a way to overcome the opalescent ray of the Al-oscans, and prepared to launch a new attack, with that, and the ray itself. Al-osk announced a highly interesting new weapon, and Sor-osk subsided. But Sor-osk found it necessary to rebuild the battleship-fleet for protection against pirates of the space-lanes. For there was fairly heavy interplanetary commerce, since Karn, the next planet inward toward Malc had been found habitable in spots, and Kartak, the next planet outward had a few mining camps—and a temperature two hundred and ten degrees below zero. Revolving at a distance of only 3,248,000 miles from the red sun Malc, the planet was eternally frozen beyond useful habitation, save as a mining camp, so rapidly did the heat of the little star decline.

But while Sor-osk was building battleships to protect her trade against pirates, Al-osk built new, very heavily armoured ships of tremendous power, equipped with very powerful rays. These were not, be it understood, battleships. No, they looked like battleships, they were armored like battleships, they were even armed like battleships, but they were not battleships. They were designed for a new use. They were to collect iron from the asteroid belt, five billion miles from Malc. Sor-osk pointed out that one of these forty-two ships could supply, in a week, the needs of Al-osk's industries for a year. But Al-osk made their iron-gathering fleet, and Sor-osk increased her protection against piracy.

* * * * *

Sharson, young science student, was very busy with a record he had discovered, a real science record tucked away among ancient official documents of a period very close to the dawn of civilization on Al-osk. He looked at the ancient metal sheets with interest, and at the attached record-card that showed a blank in the corner that should have been marked "Acted upon."

Curiously he looked to see whether the record contained the names of any of the recognized investigators of the time. There were several signatures. "Zhi Athron", he read, and "Kal Pola", and others. First he read the metal sheets that had been carefully dated according to the ancient calendar, and slowly, as he read the brief, daily inscriptions, there grew up before him a picture of the life and activity aboard one of the almost legendary Expedition Ships. There were few records such as this in existence. But he did not think of this as, hour after hour, he read the graphic, growing story. Then—with a sudden exclamation, an abruptness that made him stop, mentally dazed, he read a brief inscription of such enormous, inconceivable importance, that for minutes he re-read it dumbly.

"This day," he read, "at the seventh hour of the second term, investigations by momentumometer and gravitometer disclosed that the sun mentioned has an extensive and massive planetary system. Our search has been successful. The second,

third and perhaps the fourth planets of this system will be readily adapted to our structure, Twal Tass declares. We are proceeding to investigate."

Sharson slowly returned to his reading. For all these centuries this manuscript had lain here, dusty in a dusty file. And science had taught that no other planetary system was known in all the Universe, and, probably, there was no other! How had this infinitely important thing been overlooked? Swiftly he read on, read of the tragic ending of the ship, its wreck on the third planet, of this message enclosed in the torpedo, of the accident of rebellious, quarreling slaves—

And in the official documents attached, he read the story of official mismanagement that had buried for millenia this age-old tale of adventure and exploration and ship-wreck in the vastness of space! And—of another planetary system!

* * * * *

Sharson looked at the grey-haired Al-oscan cruiser-captain eagerly. "We are ready to start?"

"Yes—with three cruisers and a battleship as escort, to the limits of the system. I still believe it a hoax," he grumbled. "But —when Karthlon receives his orders, he obeys them."

The ship stirred slightly, and a rising hum of transpon beams echoed. The cruiser lifted slowly, and waited a few seconds as a battleship and two other cruisers joined her. Then she streaked out of the atmosphere, and, once in space, out of the system. An hour after leaving Tosk, she went on her speed-fields. Two hours later, the red star Malc was lost in dimness, and, far faster than light, they were shooting through interstellar space, toward a star of the spectral class G-O, which, to their eyes, were clear, hard blue, and very bright, and at a distance of only seven hundred and fifty light years from Malc. Eagerly Sharson watched as, hour after hour, it grew brighter on the screens. A staff of astronomers was already busy, examining ancient photographs, and new ones, taken five minutes before by themselves. A growing tension developed as the photographs checked out. There was truth in that age-old document.

CHAPTER ONE

Russ Spencer, President and owner of Spencer Rocket Corporation, and of Heavy Machinery Corporation, looked up at the knock on the door. Don Carlisle came in with a smile. "Hello, Don," said Spencer, putting down his papers. "As usual, Aarn isn't here yet."

"What's it all about this time?"

"I'm not sure, of course," Spencer replied. "I never know. I *think* it's the Magyan expedition. He's been getting his reports in order recently, and I think he's got the answer figured out."

"He's slow enough. They'll have left before he gets back."

"He said there'd be no harm in that though, remember, because Anto Rayl will be coming through with the others, and they have expedition astronomers. Besides, Aarn left a star catalogue, so when they come through from the other space, if they find that they aren't in the right part of this space, they'll probably go back and wait for Aarn. But also, he says, the time rates are somewhat different. Anyway—he had to collect the data and that took time."

"That's not all he's been doing. He's got a gang of his picked crew working on the *Nova,* renovating the apparatus of the ship somehow."

"You needn't tell me," Spencer groaned. "I'm paying for it. The Heavy Metals company had just gotten a nice stock of resistium built up, and a flock of orders for it—and Aarn calmly requisitioned the whole darned supply."

Carlisle laughed unsympathetically. "What did he want with it?"

"Go ahead—laugh. This time it hits you too. You have a one-third share in Heavy Metals, remember. And I don't know what he wanted it for. Probably some new apparatus for getting back to Magya. We went through the first time via the collision route—but even when I can pick my asteroid, I don't want that system.

"For one thing though, I know he's wild to find some system of protection against that invincible weapon of his. He naturally wants to use it, yet he refuses to use it while it's so strong he himself can't stop it. That may be what he wants the resistium for."

"I'd like to know what it is. I know one thing though, that he doesn't know I know. I *suppose* he knows it, though he may not at that. It makes heavy hydrogen out of any element it hits."

"I wish he'd—" Spencer stopped as they heard Aarn's voice.

"Hey—Spence. Open up, will you?" Curiously, Spencer rose, went to the door, and opened it. Aarn, short, tremendously powerful, stood outside. His broad, keenly intelligent face was smiling.

For some seconds Spencer looked at him, the expression of curiosity on his face giving way slowly to annoyance. "Since when," he asked sarcastically, "has a gorilla from Jupiter been too weak to open the door for himself? You knew it wasn't locked. I thought you had your hands full."

Aarn's broad smile broadened. Slowly his glance turned down to the terrifically powerful arm he raised. Thicker than Spencer's powerful thighs, the Jovian's arm rippled smoothly with great corded muscles. Aarn Munro glanced up, and seemed to look—not at, but through his friend. "Sorry—couldn't open that door. I'll tell you why later. I've got some more things to talk about." He walked into the room as Spencer made way for him, and paced slowly toward the far side of the desk. Spencer sat down again, motioning to a chair near him.

"Hello, Carlisle—the conference all ready?"

"It is. You're late as usual."

"I'll try to make up for it. I'm all ready with the data on the Magyan trip. I'd like to start tomorrow—if you can get ready. If we start then, we ought to catch Anto Rayl just before he leaves Magya."

"Sit down and make yourself comfortable. How long will we be gone?" asked Spencer.

"About a month to six weeks. I want to give the Magyans a lot of that dope we collected in the Tornan experience. That'll take a little time, but they do need help right now. Their atmosphere is probably just about as badly polluted as when we left, thanks to the Tefflan catalyst."

"Sit down, will you. You make me nervous." Spencer repeated his request. "And I'd like to come back sooner. Remember, although Spencer Rocket got along very nicely all during our original, involuntary trip to Magya, the Heavy Metals set-up isn't an old established firm, and needs a good bit more attention which I'd like to give it myself. The staff isn't as carefully worked in to cooperate as the Rocket company staff is."

"Sorry—I won't sit down just now, tell you why later. But we will need all that time. Can you make it?"

"Hmmm—I suppose so. What was the idea of taking all the resistium we had in stock on a plain requisition? You might at least have forewarned me. I had promised the Systemic Chemicals twenty tons of it for reaction stills."

"I had to have it in a hurry. Remember, those data sheets I needed were a bit slow coming through, and I'd been doing some other research, so when it came, everything came at once. I'm just about ready. We can leave tomorrow?"

"I can." Carlisle nodded.

"I'll make it by about eight o'clock in the evening." Spencer replied. "That do?"

Aarn nodded. "I guess I'll go back to the lab, then. I've got some more to do. See you later this afternoon." Aarn turned, and walked away. He walked directly toward his laboratory which was about seven miles away, and not at all in the direction of the door. That didn't seem to bother him, for he walked quite

readily through the insulated metal wall, fading gently through the colored metal, and vanishing.

With a slow, deliberate motion, Spencer rose from his chair to his feet. With a slow, deliberate motion his jaw dropped downward. "Projection!" he gasped. Then he collapsed back into the chair and stared at the spot where Aarn had vanished.

Gently, in the air near him, Aarn's voice sounded. "Handsome pair. You want to watch that, Spence, and you too, Carlisle. Those jaws will drop clean off one of these days if you don't fasten them on tighter. I'll be over in my lab any time you want to see me."

Spencer's jaw snapped shut. He looked guiltily at Carlisle. Carlisle had shut his with equal celerity, and was staring at him. Without a word, the two jumped up, raced for the door, and down the corridor to Spencer's light air-machine. Carlisle had scarcely gotten in when the momentum drive caught, and hurled the tiny thing through the air at a pace of nearly five hundred miles an hour. They started, and almost simultaneously they were stopping near Aarn's laboratory building. Spencer piled out, and ran for the door, with Carlisle behind him.

Even in the outer laboratory they could hear Aarn's bellowing laughter. The laughter of a Jovian rumbling in the small building. Without stopping to talk to the grinning Canning, and the others of Aarn's assistants, the two made straight for Aarn's door.

And stopped. Aarn was standing in the door. Not in the *doorway* but in the *door*. He was laughing still, and wiping the tears from his eyes.

" 'Two minds with but a single thought (if any), two hearts that beat as one,' " Aarn misquoted. "You wanted to see me?"

"No. I want to *feel* you," snapped Spencer. His exploring hand made a grab for Aarn's midriff—and passed through it with just the slightest feeling of strain.

"Spence—how impolite," Aarn reproved. "Mustn't be so personal. That's my periostium you're playing in I think."

"Periostium, hell." Spencer opened the door and walked

through Aarn. Inside the inner, slightly smaller lab room, Aarn stood facing the door. Spencer looked at him, and at the image of him through which he had just walked. Carlisle was visible over the image, examining it critically.

"Quite perfect," said the chemist. "Perfect coloring, even the appearance of reality."

"It is real, Carlisle, at least in part," said the two Aarn's simultaneously. "Won't you come in?" Aarn reached over, and touched a control on a rather complex panel near him. The second Aarn vanished with a slight whirling mist.

"What in the system is it? Three dimensional television?" asked Spencer eagerly. "What a find! Where's the pick-up?"

"It's not a television set. It's a telatoscope. Look over there on the bench top."

Aarn, by dumping a collection of discarded apparatus into a new heap on the floor, had cleared a space on the cluttered bench, a space some two feet square. On the square appeared a perfect representation of Spencer's now-deserted office, and portions of three rooms adjoining it. Spencer could see his secretary interviewing a man in one of the rooms, and hear their voices clearly. The images were scarcely four inches high, but in every slightest detail of color, form and movement they were absolutely perfect.

"What's a telatoscope?" asked Spencer.

"That," grinned Aarn.

"All right. It is. Where's the transmitter installed, or have you more than one to get all those rooms—but you can see even the inside of the walls! Where is the darned thing? I didn't know it had been installed, and Lord knows I've been there steadily enough."

"It doesn't have one. It doesn't pick up light. And it has an unlimited range. Any particular scene you'd like to see?"

"No transmitter! An unlimited range? Can you get Denver?"

"Will New Denver do?" asked the physicist, adjusting controls swiftly. A mist formed suddenly over the scene as Spencer started. It rolled, and whirled for a fraction of a second,

then cleared. Only one thing showed now, a sphere, dark and mottled, some eighteen inches in diameter. It was turning very slowly, with a slowness and inevitability that somehow gave it an air of majestic grandeur. And at one end of the axis was an irregular whitish spot, and at the other, a smaller one.

"Mars," said Carlisle, astonished. "New Denver on Mars—can you reach even that far?"

Mars exploded suddenly, and only a minute section of the planet appeared, tilted, and leveled on the bench top. A city with miniature buildings, miniature streets, and toy machines flying through the thin air. A great, broad avenue led straight across the bench top, away from them.

"The Avenue of the Planets!" exclaimed Spencer. "New Denver on Mars—and it's over one hundred and ten million miles away now! Man, oh man, what a gadget *that* is!"

"This," said Aarn Munro calmly, "has *unlimited* range, I think I said. Now if you want to see something a little more distant—this you won't recognize, of course, but—"

The mists swirled and eddied again. Longer this time, and the two men watched tensely. Suddenly the mists were illumined from within with a great burst of sunlight, clear and blue-white in color. The mists vanished abruptly—and over the bench-top was a something, a tiny, insupportably brilliant sphere, scarcely a quarter of an inch in diameter, but glowing with a fierce, blinding blue-white light. And far out at the extreme edge of the field, was a point of light, glowing with the same intolerable brilliance, smaller than a pin-head, visible only by its brilliance.

"Sirius," said Aarn softly, "Sirius and its Companion. Would you like to see the Companion closer—?"

The point of light centered suddenly as Sirius vanished. It expanded swiftly to a sphere as large as Mars had been, a globe that seethed with such vicious heat that the benchtop crackled and smoked, slate though it was, and the men staggered back as the radiation struck them. Aarn quickly cut down the intensity. Still blue-white, still incredibly, blindingly brilliant through a piece of darkened photographic plate, they could look at it, could

see the seething flames that shot out from it, and the whirling tornadoes, the star-spots.

"Nice way to warm yourself in winter isn't it," said Aarn contentedly. " 'Have you a star in your home? Let us equip you with stellar heat. Warm your home with the fires of Sirius or Antares, or if you live in a cold climate, try S Doradus.' "

"You mean—use the stars—any star—as a source of power!"

"Oh, well, I didn't mean it—but you could, of course. It's too inefficient though. You could get any amount of power you wanted, practically, because taking a star like S-Doradus, which I could pick up once I figured out the coordinates, you'd be practically unlimited. But you couldn't use it very well, because photocells are not too efficient on such energy intensities, and they are so bulky. The other branches of this development are actually more practical. Though I suppose it would be perfectly possible and reasonable to use an image of Sirius, for instance, to light and warm a garden or a public arena."

"I see where Spencer Rocket loses three orders. There have been orders from the big observatories for investigator ships to go out and make direct observations of the stars since we released the data you brought back."

"Don't I know?" Aarn laughed. "They've been calling me all sorts of a fool for not making better examinations when I was there. Well, with this they can bring any star they want right into the laboratory and put it under a microscope."

"But—you haven't told us how it works," objected Carlisle.

"Oh, I haven't, have I? That's simple. You know what a momentum wave is, Spence?"

"No," replied Spencer and Carlisle together. "I don't think you do," Spencer added.

"Oh well, I don't know *all* about it. But I know enough to make it work a ship. I know that one of the derivations of the wave theory of the atom showed that momentum and kinetic energy could be expressed as wave formulas. And I found how to make those waves. As a useful way for generating momentum in a ship with reactions directly on space, it was good. But re-

member, that wave theory of momentum was a mere off-shoot of the main theory of the atom. So—I started back at the beginning this time and worked on the atom. This is the result.

"You know the wave theory says that every particle of matter, electron, proton or what not, is actually infinite—it is a system of waves, cancelling automatically through all space, save in that one tiny fragment of infinity where we say the particle is. Actually, says the wave theory, that is merely a tiny spot where the vast, infinitely extending wave-system does not interfere and come to zero.

"Now—what would happen if you artificially upset this cancellation? Suppose the atom is part of New Denver on Mars. Part of its waves extend to here. They are cancelled in this part of space, so the atom isn't here. But—if I un-cancel them artificially, then, to the extent I un-cancel them, the atom *is* here!"

"Beautiful—then even the chromatic groups in dyes are there, so you get the colors and everything without any trouble at all."

"Right— plus an added advantage. New Denver when we looked at it was in the sunlight. But I can show you Honolulu. Look—"

In a few seconds the island city was in perfect miniature on the table top. And—it was perfectly visible. Tiny lights glowed here and there, lights twinkled in moving machines in air and on land, but in this miniature none seemed necessary.

"You see," Aarn explained, "the images are *real,* have real existence, so they become visible when I throw light on them. Thus, no matter how dark the scene portrayed may be in fact, it appears here fully illuminated when I wish, and lighted or not, it is dark if I don't light it!"

"That," decided Carlisle, "is about as important as anything you've done, isn't it?"

Aarn laughed softly. "Carlisle, I'm sorry to disappoint you, but you're wrong. Think over the system I use in getting these images, and you'll see that this is just another branch, another off-shoot of the main atomic theory."

"You mean," asked Spencer in surprise, "this isn't all?"

"As far as physics goes, this part of it is nothing. This does have practical significance, but to physics, this is of no great importance save as a guide-post on the way. Don't you see where it leads?"

Carlisle caught it suddenly. "Oh—if you can do partial cancellation—*complete* cancellation—?"

Aarn nodded. "Right over there, Carlisle. That's what's running this apparatus now." He motioned toward a small, cubical box, some eighteen inches on a side. From it, two beams of transpon conductive force reached up to the main aggie-coil storage bank. Blankly Spencer looked from the physicist to the black, synthetic plastic box he indicated.

"Complete—cancellation? What's that?"

"What is it? Use your head. What will happen if you *completely* cancel the waves that are an atom. Cancel them not every-where-but-here, but *everywhere?*"

"The atom—the atom wouldn't be!"

"Right—it isn't. The destruction of matter, and the release of its energy. If you completely cancel the waves of an atom within your machine, then that atom exists nowhere. It is negatived energy—and the energy of the matter—of the wave-system in other words, escapes."

Aarn walked over to the little black case, and opened the side. A series of dials on one panel-side gave control, but now as he opened it, the machine was in operation. Inside, they saw tiny, banked coils and apparatus spaced about a large glass tube. A tiny pin-hole was evidently admitting air from the room in a fine jet that burst into ionization, spread, then twisted violently into a ragged, jet-black *hole* in space. Neither light nor matter came from or passed through it. Only a strange writhing in the light that passed around it testified of its activity.

"That's the thing that does it—and where it happens. The black opening there is the actual scene of operation. Light, too, is destroyed by that, since light is similarly represented by those strange sub-space waves. Matter—energy in other words—when

converted to radiation, simply sets up a different condition in those waves so that instead of being a stationary un-cancelled spot, it becomes an advancing peak. In that condition, it cannot exist without moving, of course, and the rate of advance is exactly the square of the rate of advance of the main waves that pile up or cancel to make the light.

"This little trick of destroying both matter and light too, by the way, is going to be an important and useful thing in other ways, as I'll show you later.

"But—do you see now why I wanted resistium supplies, Spence? I had a lot of apparatus to make. Also, I made protective equipment for the weapon I told you about and showed you just before we left the Tornans."

"Then maybe you'll tell me what it was."

"Certainly, Spence, certainly," grinned Aarn. "It was a—well, I'll demonstrate. I set up apparatus here. There's a model projector."

The model projector consisted of two parts, three really; an apparatus case, attached by transpon leads to a silver ellipsoidal reflector, and beyond that about eighteen inches away, a cylindrical tube about one foot long and a foot in outside diameter, but having an inner diameter about equal to the aperture of the ellipsoid reflector, six inches. This was connected by transpon beams to the main aggie coil storage bank of the laboratory.

"The ellipsoid of course is just a projector. It's silver—but you'll notice the apparatus connected with it. That at some distance, arranged with transpon feeds, is the Seeset-invented mirror field," Aarn explained.

"What," asked Carlisle, "is that? I still don't know."

"Well—it's based on the fact that whether or not a substance is a good reflector, or a good transmitter of the light-type wavelengths, depends on the molecular structure. That is, the molecular structure of silver makes it an excellent reflector. But the molecular structure of silver sulphide makes that a very poor reflector. That shows that the forces that make light bounce back are within the rather slight intensities of molecular forces.

The field that I apply to the silver is a field made up of the combination of the three known fields possible, magnetic, gravitic and electric, in such a way that light does bounce. It's simply a super-polish effect. Binds the molecules of silver artificially in a more perfect reflecting surface than they ordinarily have.

"I could use chromium, or steel or resistium if I wanted. I thought of using resistium for a while, but found that silver is a much better conductor of electric forces, and a better conductor of heat. Despite the tremendously greater efficiency of this system we still get some absorption, so I have to allow for cooling.

"That's the projector. I use an ellipsoid because that form gives the most perfect tight beam. There's almost *no* direct radiation, radiation that is not reflected and aligned along the beam-line. An ellipsoid, being egg-shaped, has two focci. The radiant point is put at one focus, and the other focus becomes the focus of all radiated and reflected energy. But that is the focal point of one of the force-lenses such as I used in the little investigator television devices. Therefore I have *all* the radiation in a beam. If I didn't do that—the spread of the beam would tend to catch that tube out there, and heat it.

"That's step one. A beam of radiant energy. It's a pure energy beam, and comparatively harmless—so I can handle that, and so could anybody else.

"Next—to put poison in it. I 'spoil' that beam. That's the tube's job, there. The beam—a beam of plain ultra-violet light, goes so far—and the tube changes it into a corresponding frequency of gravito-magnetic radiation, instead of electro-magnetic. Oscillation between gravitational and magnetic field instead of electric and magnetic.

"It spoils all by itself. Because *gravito-magnetic radiation will combine automatically,* gravitic fields are mutually attractive. The result is that the UV photons are attracted, fuse—and come out eventually as a new, single photon when the ultimate limit is reached. And these ultimate photons—I call them *ultras*—are exceedingly nasty customers.

"Remember that the gravito-magnetic radiation will slide

through matter so smoothly it won't affect it in the least. If that stayed as the g-m radiation, it wouldn't do any good, therefore. But—the photons combine, and add up as I said—and they get so big, and so powerful, they can't remain as gravito-magnetic and return to electro-magnetic. But—now they're poison to any matter, catalytically poison, too.

"Watch." Aarn started his apparatus. The target was a sheet of resistium a quarter of an inch thick. At first he had the ray only as a pure ultra-violet beam. This gave an incredibly intense spot of light that heated the nearly infusible resistium to a temperature of thousands of degrees. "The source of the energy, by the way, is a material energy release. It's destroying oxygen and nitrogen of the air, now," Aarn added. "That's plain UV radiation. Now I'm going to add poison. I've got the stopping mechanism set up beyond there."

Aarn turned a controller—and the intensely ionized UV beam died abruptly. Twenty-five feet it had stretched across the long laboratory, but now it vanished. For eighteen inches, from the projector to the tube, it remained. From the tube, for some fifteen feet, came nothing. Then, abruptly, a hazy, pearly glow, iridescent and shining, burning with soft blue flames leaping upward, stretched to the resistium plate. Instantly the resistium, the artificial element Aarn had created from negatrons and neutrons and orbital protons instead of electrons vanished in spitting, crackling discharges.

"Resistium," commented Aarn, "isn't a fair test, because of its peculiar construction. But iron now—" Aarn threw a loose bolt into the beam. It vanished with a soft "plop" of blue flame.

"So that's what it is!" Spencer exclaimed. "Why was it so hard to stop that you wouldn't use it, and how did you finally stop it?"

Aarn shut off his apparatus. "The way I made it tells why it's so hard to handle. I can make it because finally, the ultra ray photon becomes so powerful it won't stay as a g-m radiation. Now if the g-m field won't handle it, nothing will. The Myryan collector beam will concentrate light and even X and gamma rays.

But not these. These ultras go right on by. Obviously a g-m field won't help us any by making us invisible to these rays, as it will with light.

"I finally got it—because there are three combinations of fields possible. Electro-magnetic, as normal light—these ultras, gravito-magnetic, as the field that makes them—and the last and most difficult, electro-gravitic.

"Now what 'wave' do you know of that is a combination of all three?"

"Momentum waves," Spencer replied.

"Exactly. Momentum waves. Well—electro-gravitic radiation and electro-magnetic radiation combine to produce a momentum wave. That was all I had to do—make electro-gravitic radiation. And was *that* a job! I developed another, rather inefficient system, and gave it up in disgust finally. But now—I can use all my weapons—and I have one more item of defensive apparatus."

"Is there," asked Carlisle innocently, "anything more you've got to show us?"

CHAPTER TWO

THE *Nova* LAY READY FOR HER trip. Twelve hundred feet of slim, deadly fighting machine, she had been designed as a super-cruiser. Her sleek, silvery resistium walls glittered in the sunlight. There were no ports, and no visible doors in all her length. Only here and there a projector opening marred the surface somewhat, openings covered now by the inch-thick resistium shutters.

"Where," asked Spencer, as he looked at the trim ship, "is the ultra ray projector? I don't see any new ray-ports."

"It doesn't need any. Remember, for a certain distance beyond the conversion tube, the UV beam is being transformed to cosmic. In that distance, it is a purely g-m ray, and as such capable of penetrating any matter harmlessly. The projector is just inside the wall, and the ray shoots right out through it.

"You all set?"

"I hope so. Did Martin bring my junk over?"

"Yes. Most of it is in the lab," said Aarn placidly. "I told him you wouldn't need all that wardrobe. You aren't going to be gone long, and we forgot to put in a trunk room when we built this thing. Since I installed the telatoscope and the material engines, the ship's a bit crowded. I tore out the old atomic engines."

"That was nice of you. I had a collection of engineering texts in those two trunks."

"They're in the ship's library," replied Aarn. "Really, though, were you going to clothe the whole Magyan people?"

Grumbling, Spencer followed Carlisle and Aarn into the gleaming ship. The lock, a great block of resistium, opened smoothly as they approached, and Canning smiled down at them.

"The old crew back again. Martin's all set inside. I checked everything."

"The old crew," Aarn nodded. "But a few additions in this ship." They entered, walked through the inner lock door to the main corridor, turned right toward the bow. Through the lounge, they passed on to the chemistry laboratory, then to the calculating room, and physics lab, and finally the great fore power room. The hulking atomic engines had been torn out, and in their place, a series of five foot cubes ranged in two rows of three formed aisles down the center. The instruments, direct reading instruments on all the circuits, and relay-instruments on the more vital circuits, banked the walls. Here and there a few tubes glowed dully; and all the roof was arched with great, softly glowing transpon beams, idling now.

"This place looks different," agreed Spencer, glancing around. "There are a lot less beams."

"Yes, the greater concentration of power in a material engine permits the running of a lot of the weapons on subsidiary power. They aren't transpon-connected to the main power supply, and work independently. A couple UV beams, and a vastly improved magnetic, gravitic and electric bomb apparatus. Controlled as before—but your intensity control has a greater range. I'll show you some stunts with it later. That makes, though, for less congestion here, less fighting drain on the aggie-coils, and less transpon-beam apparatus. Also, decentralization is the life of a warship.

"With this system, I have a lot better decentralization. The aft power room is, of course, identical." The *Nova,* in pursuance of Aarn's policy of decentralization—and making vital spots less vital—had two power rooms, each equally capable of running the entire ship.

The control room, as they entered it, appeared even more radically changed. The ship had no direct vision, because direct

vision meant a possibility of a direct hit by the enemy. Instead, great television screens formed the wall of the control room, giving an entirely false appearance of perfect transparency. Thus they could see while remaining inaccessible.

But the control panels, heretofore banked high, had been lowered, and even further simplified. The driving station was banked at an angle of thirty degrees, and starting at almost lap level, rose to a point about even with the pilot's chest. Beyond it, a great telatoscope stage had been installed, and the pilot now had a perfect three-dimensional model of everything about the ship. The range of the instrument could be altered, in accordance with circumstance. The two war-controls, the weapon boards which were the special provinces of Spencer and Carlisle, were mounted well to one side, so that they could get an angling view of the scene.

"Yea, verily, it is changed," mourned Spencer. "Don't blame me if I blow up a city instead of taking momentumometer readings."

"You'll get used to it," laughed Aarn. "And just sit down and look. I made my calculations for 8:35:30, and it's almost that. We have to get out about a hundred thousand miles first."

Aarn seated himself at the controls, and suddenly there came a soft hum of power as the transpons poured power into the antigravity apparatus. Gently the *Nova* rose from her berth, and floated out of the great shed under the slightest of momentum wave impulses. Then with a sudden swooping acceleration, she dropped Earth far behind, rushing through the atmosphere in less than three seconds. Aarn's flying fingers, moving with a speed only Jovian-trained muscles could have attained, brought the ship with beautiful precision to the appointed place. Aarn halted, and looked at the chronometer. With a flip of his fingers, the telatoscope suddenly expanded its range, and the whole Minor Planetary Range appeared, the sun a glowing ball, the four Minor Planets circling slowly about it.

"I hope," observed Carlisle, "you make a better shot at hitting Magya than you did at hitting Earth the last time you tried

to cross the interspace."

"I think I will," Aarn smiled. "This is a simple job, anyway. Remember, when we hit the asteroid last time, we were hurled into interspace by the space-tension developed about our various fields. But once you get into the interspace, due to that peculiar strained condition of Magya's super-tensed space, you can cut off power, and fall right to the sun Anrel, around which Magya revolves. It's coming back that is a trick. And now—with observational data from both sides—I'm pretty sure I can make it. Anyway, the time's up."

Aarn threw over a little tumbler. Abruptly the ship roared and shuddered to the titanic powers that coursed through the transpon beams. Space strained, and cracked under the enormous forces—opened—the *Nova* dropped into the fifth dimensional interspace between four dimensional universes.

Utter dark descended on the *Nova.* The beams and the lights alike failed. Utter silence. Then slowly a ghostly mist appeared about them, and abruptly the beams and lights were back. The noisy shout of the transpons died suddenly to a whisper, and the mists dissolved.

Aarn grunted, and pointed to the telatoscope device. Near, titanic, a globe of flame four feet across burned in awful violet flame. The forward television screens on the wall were blank, flickering sheets of violet color, wavering and melting. "Overloaded the photo-cells. We must be within a billion miles of Anrel, and considering that Anrel's five hundred million in diameter, with a surface temperature above 10,000, that's much too near." Aarn set to work, and suddenly the telatoscope image wavered, flickered and shrank. Aarn watched it with a paternal smile. "I wondered if it would work when we went faster than light. We're going about 1000 times the velocity of light. I don't know what speed that telatoscope wave has."

"Yes, but where's Magya? I can't see it there." Spencer pointed to the telatoscope stage.

Aarn laughed. "Easy, my friend, easy. You want too much. Remember that that was set to show the minor planets of the

Solar System, a range of about two hundred million miles. I did make some correction in coming through, but still, Magya is one and a quarter trillion miles from Anrel. On a range that great, the telatoscope, to show the whole space, would have to reduce Magya to an invisible pinpoint. Now," he added, "I'll stop for observation."

The *Nova,* which had been half into the interspace condition, where distances meant nothing, since distance in the fifth dimensional space became meaningless, and high speed possible, relapsed into the normal space, and slowed. Anrel was at a more comfortable distance now, nearly a trillion miles. Still, the titanic sun was as hot at this distance as Sol is at Venus' orbit. A brilliant flaming violet disc on the screen, the other stars of this space were visible about it now, since it no longer overtaxed the photo-electric cells. This strange space, with its countless myriads of ultra-first-magnitude stars seemed to gleam in a solid curtain of flame. Here and there an even brighter super-giant sun spotted the jet of far space.

Planets were invisible against such a background. Aarn re-adjusted the telatoscope, till only the inner planets of Anrel were visible. With a sweep of a billion miles, six of Anrel's family of eighty-seven major planets became visible, six glowing points of light floating over the telatoscope stage beside Anrel. So close were they to the giant sun, they were heated constantly to incandescence.

"Hmm—recognize them?" asked Aarn.

"Naturally not. You've got the tables, I suppose?"

"Yes. Let's see." Aarn pulled a slim book of metal sheets from a shelf beneath his control board, and looked at it and at the diagrams and tables. "I still," he said with a sigh, "don't read Magyan with any facility. Come here and help."

In some fifteen minutes, the two had located and identified the various inner planets. Then, by means of the tables, they calculated the length of their absence as about eleven months of Magyan time. That is, two hundred and thirty odd Magyan days, for Magya had a "year" nearly 90,000 earth-years long.

"Next, where's Magya?" asked Carlisle.

Aarn returned to the controls. "It should be about here—" The scene on the telatoscope shifted and the mists whirled for a few seconds. Then it steadied—and six inches from the center swam an eight inch sphere. Near it, two smaller spheres circled with barely perceptible motion.

On the mottled globe of the planet, a dozen tiny, intensely glowing spots were visible. "Magya!" exclaimed Spencer. "You can see the transpon-arc stations still burning the nitric compounds in the sea back to atmosphere."

Abruptly the scene swirled away, shifted, and solidified again. They were inside a great, underground city now. A dozen titanic metal bulks loomed deserted near them; beyond, a great cavern, lighted brightly, swirled with people, human in every characteristic, this other-space branch of the human race of Earth. Slowly the scene rocked back and forth as Aarn attempted to steady it. A broad, happy smile was on his face as he cut the scene.

"I can't hold the thing—planetary motions, besides my own. But—that's old Magya again."

Suddenly, faster than light, the *Nova* raced toward the planet. In minutes the tiny point of light that was Magya grew to a disc, swelled, and then explosively became a planet. At two hundred thousand miles, Aarn relapsed to normal space. On the momentum drive he swept nearer.

Abruptly the radio, over Spencer's panel, spoke. "Stop! What ship, where from? Wait for examination!"

"The Magyan patrol!" said Aarn. "Where is he?" In a moment the telatoscope was functioning, the ship becoming visible twenty thousand miles from them. Aarn grinned happily as he set to work.

Anto Marth, commander of the patrol cruiser, looked anxiously through his periscopic telescope at the distant ship. She was strange, slim of line, and powerful of build. The metal that sheathed her was strange—she had made no answer, and more than enough time had elapsed. "Stranger!" he called sharply into

his microphone. "Stranger, stop for examina—"

Anto Marth stopped in mid-word, his mouth gaping in astonishment. "You called?" asked a voice in perfect Magyan. The voice came from an image of the upper part of a man. There was a face, a broad, dark face, smiling pleasantly. There was a very short neck. And there were tremendous, broad shoulders, banked and plated with great muscles.

Anto Marth's expression of utter surprise changed abruptly to one of incredulous joy. *"Aarn Munro!"* he gasped. "Aarn Munro of the Old Planet!"

"Right. Aarn Munro and friends. You are Anto Marth, aren't you? Cousin of Anto Rayl?"

"Yes, Commander. You have returned? What has happened? How is it you return in so powerful a warship?" Anto Marth was suddenly worried. There was peace on Magya for once, after generations of fighting the hated Tefflans. Was there war now in the Other Space?

"Only accidentally, Anto Marth," laughed Aarn. "We came to tell Anto Rayl the data plates were wrong. He has not gone yet, has he?"

"No, but he is preparing to leave now—the ship was to start in fifteen hours!"

"Then let us hasten. He will be lost in space if he starts on the wrong data."

It was nearly two hours later when Aarn and the others were able to speak alone with Anto Rayl. First had come a hurried, but joyful, official welcome. Magya welcomed back the men who had done so much for her.

"And now," said Anto Rayl at length, looking at them with his keen, gold-flecked grey eyes, "I can welcome you personally. And what is this wonder-ship you have brought? Did you find your world successfully?"

"We found it—but not until we had found first another and strange race in our own space which had telescopes and plates that would show us the exterior galaxies, and the space-marks

that could guide us home. It was this race that built our new ship, for our help in their battle. Really," Aarn laughed, "we seemed to have such a facility in getting into trouble, we decided we needed a battleship rather than a laboratory. Besides—our old *Sunbeam* was destroyed.

"And when we got home, we came back here so that we might guide you on your trip. Also—we have brought some things that will be of great help in your destruction of the last taint of the Tefflans—the nitric compounds."

"We have done a great deal to overcome that already," Anto Rayl said. "We have been fairly comfortable in our cities since the catalyst that caused the nitrogen and oxygen to burn out of our air was destroyed. But we have also done what we have always wanted to. On the planet Sharlon, we have established a large colony. There, there is no air trouble.

"But what is it you have brought?"

"The energy of matter," Aarn replied. "The sun-tapping transpon beams that are taking their power from Anrel are inconvenient because of the diurnal rotation of the planets. With this energy, for planetary purposes, you will be greatly helped."

"The energy of matter! We will indeed."

Aarn had prophesied a brief stay on Magya, while the Magyans learned the new apparatus Aarn had developed. But it became a six-week stay in the end. The cities had to be equipped with apparatus for making the material engines, and the first engines set up before Aarn could leave.

In the meantime, he was becoming acquainted with the hundred and fifty fine old Magyan scientists who were to take the trip through to the Other Space, and the Old World, the mother world of Earth, from which, ages before, the Magyans had come. These men were the representatives of Magya who on Earth were to study the ancient history of their race. And with them, Earth scientists would study.

The trip was to be made in a great new battleship, the *Sarn Magya,* the last battleship made before the Tefflan enemy had

been finally conquered. Now, however, it was being equipped with all of Aarn's newer devices.

"But why you wanted to take through such a big thing, I don't know," Aarn commented as he looked over the mighty four-thousand foot bulk, its cold, grey walls of four-foot armour steel gleaming dully in the light.

Anto Rayl laughed. "Suppose, " he said, "we'd gone through without your new data. Then we might well have found use for those great walls. Besides—it permits our taking the vast quantities of records and samples we wanted, and also of bringing back much."

At the end of six weeks, the giant *Sarn Magya* and the *Nova* prepared to make the return trip. It would be a return trip even for Anto Rayl—a return to the home world his people had left ages before.

Up from Magya they sailed, together. A fleet of smaller craft sailed beside them, to watch the departure. At half a billion miles from Magya, the viewing fleet stopped, and, twenty thousand miles from the greater machines, watched.

As they saw it, abruptly the ships raced away, one after the other. They vanished, in infinite distance—or infinite smallness, the watchers could not, somehow, tell which . . .

CHAPTER THREE

TO THE MEN IN THE SHIPS, FOR an instant there was the blankness and the lightlessness, then a long straining pull—then again the dissolving mists.

Aarn's data was exact this time. Sol shown bright and clear, four hundred million miles away. Eagerly, the Magyans looked about them in wonder at this puny space of puny suns. The stars were so small! The space was so blankly, darkly black! Even this sun, the old sun, was a weak and feeble thing, beside the titanic thing they knew as "the" sun.

And the planets! They all clustered about like chicks following close beside a hen! They were—

Abruptly, every alarm on the great *Sarn Magya* screamed in warning; automatically her various protective devices flashed into action. And abruptly, from somewhere in space, a great, milky opalescent column reached out, touched the nose of the great ship, and just as her great protective energies went into action, the nose of the ship, a ten-foot plug of solid metal, softened, ran, and flared off in flaming, brilliant gas—

Simultaneously Aarn was aware of the utterly unexpected menace. A terrific, stabbing beam of that same milky opalescence stretched out toward him—and died a few feet short, as automatic defense sprang into action with greater speed in the smaller ship.

Aarn grunted—and acted. Almost simultaneously, he saw the attacking ships, and saw the great battleship near him fade abruptly into infinite smallness—or distance. The attackers were

cruisers, full-fledged cruisers, slim and powerful. And one of them charged down suddenly with terrific acceleration at the vanishing *Sarn Magya*—and vanished. Vanished with the vanishing battleship!

Aarn was too busy to watch. The telatoscope was at work, and about him he knew were four ships, all as large as his. And all attacking him now with utter ferocity.

"Enemies — here!" snapped Spencer. "Is this the Solar System?"

"Yes!" Aarn growled abstractedly, "Earth's been attacked! Get going—*they* have."

Already a shower of tremendous magnetic, electric and gravitic field bombs were exploding in their protective screens. The milky ultra rays reached out from all the ships suddenly, and the transpons within the *Nova* strained and roared at their attack at her momentum waves.

Aarn released his own ultra, a terrible driving beam that tore at the nearest ship in a blaze of energy—and abruptly the enemy craft was sheathed in fire. Aarn gave a low exclamation, and turned his power to the absolute limit, bringing another ultra to bear. Like an extinguished light, the defense of the enemy ship failed, and in an explosion of gas, the ship vanished. Aarn turned his attention to another. A titanic transpon beam was roaring from the enemy ship now—a transpon attacking them. Aarn was blinded by light-vision, for his own protective sheath was shorting out the transpon in a washing flame of stupendous fire half a mile long. But the telatoscope showed with precision as his beams centered on another ship.

"He doesn't mind any of my force-bombs," said Spencer calmly. "I'll try that steel-explosion, and the rest of the assortment."

"You needn't try the steel-explosion. He's using it on me. That means they can stop it," snapped Aarn. "Try the atomic rot—"

Aarn was busy with something new. A stream of the green-glowing atomic rot bombs, bombs of controlled atomic disintegra-

tion that would spread slowly through any element heavier than iron, were flashing out from the *Nova.* And—at about a thousand feet from the enemy ships, they died.

"Gamma—gamma by the ton!" exclaimed Aarn. "They're using a gamma-explosion bomb—it's so powerful its heating the resistium sheath."

"They've retired," pointed out Carlisle. "My material stuff is stopped dead; they've got everything we've got, anyway!"

"No they haven't—they're afraid of their own gamma. That's why they backed off. I'm going—" Aarn went. He went after the nearest one. Ten huge gamma-ray bombs imbedded in the magnetic atmosphere of the *Nova* went along. The enemy ship fled at his top speed, but the *Nova* kept pace with him—and suddenly Aarn realized the ship was out of control. "They couldn't stand that. Item one. Where's that other pair—"

They were right after him—at a safe distance. Both were turning every weapon they had on the *Nova.* The *Nova* stopped, out near Uranus now. Aarn turned to another weapon, testing rather than hoping. The neutron beam, a beam of neutrons that would shoot through five feet of beryllium—

"Stopped—I'll bet they have water tanks to do it. One more now—"

The green terror the Seeset had developed, and Aarn had improved. The green space-cups, super-saturated space fields that no weapon, no screen could stop. Long lines of them shot from the side of the *Nova,* toward the enemy ships. A cosmic ray raged at them—and a few stopped. The rest bored on. Bombs, rays, material destruction—

"My friends, you don't know those things," said Aarn grimly. "Now watch—"

It happened, as Aarn had expected. One, then the other ship allowed the strange green things to fasten in their magnetic protective screen. The space-cups bit into the magnetic field, stopped, and stayed there. Furiously now, the ships were attacking the green space-cups, neglecting the *Nova.* Aarn did not attack, beyond sending more of the green terror.

"They're trying to get away," he said with satisfaction. "They can't, of course — the space-cups anchor them." He watched. The space-cups advanced with the slow, deadly precision of a marching, indestructible army. They died—but in dying, anchored the ships that killed them. Super-saturated, an addition of energy threw them half-way into the fifth dimensional interspace, but only half way. For some thirty seconds they remained in between. And in that time, they made a safe spot for other green space-cups. In a minute and a half, the space-cups had reached through the protective magnetic atmosphere, and were devouring the metal of the ships themselves.

Aarn reached for the telatoscope controls to take a look within those enemy ships—and withdrew his hand with a jerk. A new thing had emerged from the mists that rolled at the edge of the instrument's field. A gigantic shape. A full-fledged battleship. Aarn turned furiously to his controls.

"Look out below!" he called. A terrific stream of the green space-cups was issuing instantly. A cloud of them. But this ship learned from its fallen lesser brethren. It avoided them assiduously. Steadily Aarn drove them out, bringing to bear as best he could, the slight directional control possible with a thing so negative as the space-cups.

The enemy ship danced, jerked, and moved. But four titanic ultra rays were playing continuously on the *Nova.* Aarn's face was pale with intensity. "We can—stand that—indefinitely thanks to—material energy," he said grimly. His own ultras were concentrated on this lone giant ship. The *Nova* was a cruiser in size—but she was actually a super-concentrated battleship. The material engines, limited only by the almost illimitable power of the transpons to conduct, were fighting the ultras. They would never give out.

Gamma rays were flooding the whole region. Flooding it horribly, but the artificial metal resistium, made only of negatrons, protons and neutrons was so concentrated that even these intense rays stopped instantly.

Aarn stopped the manufacture of the green space-cups. His

enemy was avoiding them, and they took tremendous energy. More power was available for other lines of action. The great ultra rays, operating independently from their own material energy generators tore and raved at space, and at the vast flaming shield of the four thousand foot battleship.

"I," said Spencer softly, "am stopped dead. He's got every single one of them stopped. Crumbler beam—steel explosion—everything."

"I'd like to know how he does that last without resistium," said Aarn. "The crumbler isn't so good, but put all the power your steel explosion will draw on him. See if you can get through."

A new spot of intense radiation flared and sputtered at the energy walls of the enemy battleship. But didn't eat through. Aarn grunted bitterly. "He's after me all down the line. We have no material circuits—and the energy of those huge aggie coil banks to hold. I'm even drawing a little power for charge from the aft material energy. He can't break in—till he gets—Whoa—another battlewagon—*It's Anto Ray!*"

A titanic thing had swung up suddenly from nowhere. A thing as big as their giant attacker. It was spitting ultras and varied forms of abuse at a tiny, fleeing enemy cruiser. The Magyans saw the greater battleship fighting with the *Nova,* and abruptly diverted their deadly attack to it, while the cruiser fled with badly leaking screens, a damaged, half-wrecked ship.

The nose of the *Sarn Magya* had been torn off in the first unexpected attack. That was no great annoyance to a battleship. With deadly, concentrated power, the huge thing bored into the enemy battleship. The enemy had to pull in his rays instantly to support this additional attack, and abruptly his ultra screen was leaking—the ship flared with a slight, shifting cloudiness as one of Aarn's rays leaked through. It shifted, melted—and suddenly the ship lurched, and vanished!

Instantly, Aarn was working with incredible speed. The telatoscope field expanded immensely, caught a darting flash, contracted on it, and held, as the *Nova* started off after the flee-

ing giant at a speed far greater than light. Fifty thousand times that of light, yet the telatoscope rendered the scene faithfully. Aarn glanced at a different part of the screen. Another giant battleship appeared—Anto Rayl in the *Sarn Magya* following faithfully. Faster the enemy fled, evidently startled to find his enemy following him so easily. At eighty thousand times the speed of light, he evidently found his maximum. Gingerly, Aarn was setting up an automatic control that would make it possible to overtake and hold him.

Three minutes were needed to maneuver into position beside him. Then Aarn stopped with a hesitant, uncertain air. "Now you've caught him—what are you going to do?" Carlisle asked.

"I don't know," confessed Aarn, "I can't attack him at this over-light-speed except—got it!"

Aarn was working suddenly over Spencer's board. Spencer bent back away from Aarn's path as the long arms worked skillfully setting up controls. Finally he pushed a control to the ultimate limit of its run with a grimace of uncertainty. "We shall see—" He pushed a final trip. Instantly, a thing the size, perhaps, of a golf ball darted from the side of the *Nova* in the direction of the straining, damaged enemy. For a few feet it shot at a speed that made it a blazing, reddish streak. Then—abruptly it slowed to a crawl. For five feet more perhaps—then again it was speeding, enlarged. It expanded to a ten-foot diameter.

Suddenly it was gone—gone in a stunning flash of speed beyond light, and a titanic explosion of energy. Automatic controls stopped the *Nova* as it stopped.

Aarn had allowed the *Nova* to creep about five miles ahead of the enemy ship. Now—the enemy ship was perhaps a thousand miles behind, motionless, its lights winking and changing rapidly, dimming abruptly to invisibility, mounting to brightness, then steadying.

Aarn swept back on the momentum waves. Perhaps three light years behind was the Solar System. But the enemy ship was near now, and fighting desperately. Savagely, its beams and nor-

mal defenses, unweakened by the super-space attack, in full action. The *Nova* waded in savagely. All the ultras were blazing, the space-cups again floating out.

Anto Rayl appeared suddenly in the *Sarn Magya.* He had overshot the mark, as the stranger was halted abruptly, and had to run back. Now he too joined in the attack.

Two minutes later, surrounded by the haze of hydrogen atoms that had once been the metal of the enemy ship, the two stopped for a conference.

"You promised me a warm welcome, Aarn," said Anto Rayl, faintly sarcastic. "A warm welcome, and the peaceful Old World. The Old World where there was no Tefflan race to disturb peaceful interplanetary commerce."

Aarn laughed. "Sorry, Anto Rayl. I couldn't help it, you know. I really didn't mean quite so warm a welcome. I'll have to be getting back there pretty quick. I think you'd better go back to Magya for a while while we settle this. Were you badly damaged?"

"Naturally not. They took only the nose—the metal ram-cap and the first fifty feet of the rooms. Just mess halls and empty quarters. Nobody hurt, of course, and the bulkheads closed as usual. We were just astonished, and dropped back for safety. Apparently one of your welcoming committee was too close, and got carried along with us. He was with us there when we landed in our space, so we opened on him, and darned if the thing didn't vanish. We thought he must have come back, and started after him, and to come to your aid. Apparently he'd just started off in speed greater than light, and when we started back, somehow we pulled him along.

"I didn't notice what happened to him—started in on the big fellow you were playing with. What happened to you?"

"Nothing much. Our smaller screens and things got into action faster—"

"You mean, your better designed apparatus got going faster," interrupted Anto Rayl.

"Anyway, we weren't hurt at first, and as you see, those

fellows have poorer defense screens than we have. Their cruisers went down pretty fast, and until they learned to avoid the space-cups, they got into trouble with them. Then that big fellow showed up—and your help was greatly appreciated.

"We'll have to head right back for Earth—I suspect they may want to see us. And you'd best head back to Magya. I'll come through again when we get the present situation cleared up."

Gently, Anto Rayl's laughter came through the microphone. "Aarn, tell me, what defenses do you think Earth has?"

"Why, I don't know. Of course they had the Patrol Fleet, to begin with. Some of them had been equipped with all the devices we knew, except the telatoscope. The ultra ray apparatus was just being installed when I left. Some of the big Patrol ships are full sized cruisers."

"How many were there?"

"About twenty," replied Aarn grimly. "When I left."

"And how many do you suppose there are now? I think I can answer that. Not—one—blessed—ship.

"Aarn, Magya has, still set up and in working order, the great ways that turned out our five thousand foot battleships, the ways that held the twelve hundred foot light cruisers, and the fifteen hundred foot heavy cruisers. The ways that made destroyers are making commercial ships right now.

"Magya has a fleet of fifty-four full-sized, fully equipped battleships. They still lack a few devices, but only a few. There are one hundred and four heavy cruisers, one hundred and twelve light cruisers, and six hundred and forty-two destroyers.

"Aarn, when Magya was hard-pressed by her ancient foe, the Tefflans, you came to us, and gave us the means of destroying that enemy. The common enemy of our single race. You don't for a moment think that Magya will let that great fleet of warships lie idle, while Earth fights for her life against such odds? While Earth, for lack of any fleet at all, is overcome?

"I'm going back, Aarn. We will start construction of newer ray apparatus at once. I will meet you in about one hour in the

neighborhood of the point where we first came through the Wall."

The great *Sarn Magya* faded suddenly away, and vanished. Aarn didn't have a chance to say a word, but slowly he turned and looked at Spencer.

"Spence—that man's—oh, he's a MAN and his whole people are MEN—men of our own race. I'm mighty glad they are our own race . . . We'd better hurry back to Earth."

Faster than light, far faster than they had come, the *Nova* hurtled back toward the solar system. Cautiously, Aarn stopped at a distance of 500,000 miles from Earth, and went to work with the telatoscope.

The Moon was changed. There were great pits and holes in it, great pock-marks of ultra rays. And in the center of each pock-mark was a gleaming metal dome. They were the very well equipped Patrol stations on Luna. There were also glowing red spots, seething angrily.

Earth had a few scars. Only one seemed serious, and that was a swath through sparsely populated Arabia, and on into the Red Sea. Smaller ones, though, marked nearly every continent.

There were no ships flying about near Earth. But Aarn noticed with grim interest that Earth had half a dozen new moons, little moons perhaps five or ten miles in diameter. And each one was a focus of working, straining commercial ships, and a few Patrol ships. A constant stream of ships was running back and forth.

The great Transpon Station on Luna was working over-time it seemed, the beam flickering more rapidly. But—a new giant beam stretched across the solar System. A great thing that reached out and out beyond Jupiter, beyond Uranus, and ended near distant Pluto.

Aarn looked at this for some time, as a slow smile dawned. Carefully he looked at his instruments. Suddenly he looked up at Spencer with apparent indignation. "Spence—observe. Observe the unmitigated gall of that enemy race using *our* sun to fight *us!* Something must be done. It is too much."

Aarn hurled the *Nova* nearer the great beam. They were within a thousand miles of it when he stopped, watching the slow, rythmic sweep of the titanic power lead, that carried power in mighty surges from the sun, the very power-center of the system, out to feed the machines of the Invaders on distant Pluto.

Carefully Aarn examined it. At last he smiled again. "It is too much. Maybe it is too little. Anyway, we'll make it more. I learned something a while back that may be—"

Curiously Spencer watched as Aarn worked at the transpon weapon controls before him. His settings were unusual, to say the least. Finally he appeared ready. He glanced up at the chronometer, and then pushed over his control. Nothing whatever happened. The *Nova's* transpons reached out, and touched the gigantic beam that was bringing war-power to the Invaders, but they neither gathered power nor released it. No slightest change appeared in the beam.

With tense face Aarn watched the chronometer. The tension seemed to increase as the seconds ticked by. "I wish," he said, "that that was Anrel, in some ways. It would take a long time—but I wouldn't have to worry about unstability there."

"What are you doing?" asked Carlisle annoyed. "You don't seem to be accomplishing much."

Aarn's chuckle as he replied was a bit grim. "Not much. Wait a bit. My—there!" Aarn pulled back his control. "My problem is, Carlisle, the instability of our sun. It can't stand too heavy a drain."

"What?" cried Spencer. "It can't stand too heavy a drain! My God man—what did you do?"

"Wait six hours. Or more. We're going to Earth now. First—"

The telatoscope went into action again. Delicately, by means of clock-work drives, Aarn established contact with the Earth, and finally with the shops of the Spencer Rocket Company.

The shops were swarming. Spencer gasped as he saw the armies of men laboring under great flood-lights, working at top speed. Night had fallen here, but the work went on desperately.

A great domed structure had been erected, hastily, evidently, but curious, ugly snouts stuck from it. A gigantic, roughly housed aggie-coil bank stood to one side, and beyond that, a set of eight of the largest material energy engines Spencer had ever seen.

"Hmmm—they did a good job. Those are the type K-6 engines I left plans for," said Aarn calmly. "I'll bet they've been overworking my lab workers. But they've sure got that ship-yard protected. With those defenses, I don't see how a whole battlefleet of Magyan proportions could crash in.

"I'm going to get hold of Scott." Scott was Aarn's principle laboratory director. Aarn found him finally near the group of defense engines, in consultation with six or seven other men, the number varying as one rushed up, and another rushed off. Aarn projected his image. It was a bit unsteady, but sufficiently good to be very easily visible.

"Oh, Scott—busy? I'd like to talk with you."

"Munro—" gasped the startled man. "Dr. Munro—thank God your back. Where are you? Come on in, for the love of heaven—Earth never needed any man as she needs you. You're the only man in the system that knows space warfare on this scale. Dr. Munro—Earth's been attacked by monsters—Centaurs! They've attacked—"

"Yes, they've attacked. They attacked me. Four cruisers and a battleship. I've returned the compliment. But I thought I'd just signal ahead so you wouldn't turn those very respectable planetary defenses on me. You might tell Commander Barret to bring his staff there. I've got some real aid for him—lots more than you'd think. I've got the whole Magyan fleet on the way, I think! A fleet of experts, and they promise to aid us with the ship-building equipment they have.

"Send out word to let the *Nova* pass. She'll carry four lights, one ultra-violet, one the sodium-D line, and one calcium K light. The fourth will be general infra-red. That's a fairly distinguishable combination. I'll come through in seven minutes. That gives you time enough?"

"Yes—certainly." Scott answered, but already three men in

the Planetary Patrol uniform were racing for the entrance of the rough fort that had been set up here.

Seven minutes and thirty seconds later, the *Nova* halted in her regular berth, near the Spencer Rocket Yards. There was a swarm of men around her in an instant, under the orders of four gang-foreman.

Scott arrived at the lock almost simultaneously. As Aarn opened it to him, he called in: "Dr. Munro—what do you need in the way of services for war preparations?"

"Not a thing, Scott. This, remember, was built as a super-battleship."

"I see you weren't scratched, in the fight."

"Haven't you yet discovered," asked Aarn grimly, "that one is *never* scratched in a space battle? One is annihilated—or left unscathed. At least in a ship of cruiser size."

"The Patrol *has* been scratched. The first warning we got was the interrupted message from one of the small cruisers out near Neptune."

"Who are the invaders? I haven't had a chance to see them yet, though I suppose you've had the telatoscope busy. And where are they—how much have they occupied?"

"Fortunately," sighed Scott, "not much. They didn't know just what we had, and established a base first, and investigated later. While they were basing, we were too. They based on Pluto—you probably saw their transpon beam picking power from the sun."

"Uhm," said Aarn with an enigmatic smile, "we did."

"By the time they'd based on Pluto, we'd defended the planets we could, and wanted to. We gave up the four outer ones, established a collection of forts on the Jovian Moons, and on the Martian Moons, and set up plenty of stuff here on Earth. The Centaurs started to attack the Jovian moons when they got into a position where sun-tappers wouldn't be available—behind Jupiter. They got fooled—all the forts had the type K-6 material engines.

"So far, we've seen only five battleships, and we think that's

all they've got."

"They've got four, then, now," commented Aarn. "Anto Rayl and the *Nova* disposed of one of them."

"But they've got a lot of light cruisers, according to your descriptions and photographs of Magyan light cruisers. That fleet couldn't attack our planetary defenses, and had to quit. But they proceeded to set up planetary defenses of their own. They actually hauled ten asteroids from the asteroid belt, and set them circling Pluto in a maze of orbits. They've been fortified, and we took the hint, and did the same. You saw ours? They're still under construction. They—look—*the sun*—!"

All Earth was suddenly darkened. It was barely dawn in this region, but suddenly the ruddy disc of the sun had darkened, dimmed to an even deeper red, like a dying coal! Suddenly, as abruptly as though some one had put a gigantic radiation screen before it. Then it was struggling, flaming visibly. Darkened as it was, every man on that side of Earth, and on the Moon, was watching as direct vision of it became horribly possible! Something *was nearly extinguishing the Sun!* Sol was tearing, struggling at the suppressing force. Visibly, great sun-spots, so huge they could have swallowed all the planets of the system, expanded with a speed that must have meant hundreds of miles a second. Others appeared abruptly in a hundred places, expanded, and became visible. For two long minutes the frightful dimming lasted. Then—as quickly as it had come, it was gone. Instead, the sun blazed blue-white, hotter and fiercer than ever it had before.

Aarn had not seemed perturbed at the darkening, but now he watched intensely. Suddenly he turned to the telatoscope. The ball of the sun appeared, dimmed artificially till it could be watched. It was blue, blue with heat far greater than normal. Already, outside they could see men running for shelter from the suddenly blazing rays. The telatoscope showed a sun that was marred in a thousand places with great leprous spots. Silently, Aarn watched it for minute after minute. Then—he sighed with relief.

"Well—it's all right. The thing will damp out in a year or so. No damage done. The spots are beginning to collapse already."

"But Aarn—what in the name of the planets did that?" cried Spencer.

"We'll see later. Now Scott, have you called Commander Barret?"

"Why—why, yes, of course." The dazed physicist collected his thoughts. "Yes, I called him. He ought to be here soon, as he said he'd come. He was at a conference of the International Defense Committee. He said he'd bring them along."

Aarn suddenly burst into laughter. "The International Defense Committee! Scott, that's too good! That's one international committee that just naturally *has* to accomplish business. For once one of Earth's international committees won't waste all its time on terms. 'This must be done—do it, and we'll discuss the thing later.' That's the spirit of this International Committee."

"I think it's arrived," said Scott looking out. "Shall we go to them?"

"No, they'd better come here. I want them to take a little trip with me. This is the only ship that can make it, and while it may not be comfortable, it's the safest ship in the System."

There were ten elderly civilians, distinguished looking old men, and curiously unlike the average international meeting. They walked in step. There was a unity in their very motion. And their leader was Commander Barret.

Commander Barret was six-feet-three in height, his lean, lined face topped by thick, bushy iron-grey hair. His eyes were blue, blue as liquid oxygen, and at times as cold. His face was dark as a mulatto's with the fierce sun of space. His hands were lean and hard and strong. He was fifty-seven, and looked forty, his powerful body erect and dominant with vigorous life.

Aarn Munro met him in the lock-way. Aarn, the typical Jovian-born human, his body eight inches shorter than the Commander of the Planetary Patrol, but nearly a foot broader, so short, so heavy, he appeared fat, his strength truly that of a Titan, super-

humanly muscled, his arms sticking out at a peculiar angle to his body due to their great muscles. He made a strange contrast to the tall, slim strength of the Terrestrian.

Commander Barret stopped, and looked down into the keen eyes of the Jovian. A slow smile spread across his lean features. "Dr. Aarn Munro? I know you must be, with that build."

"I am, Commander Barret." Their hands met in a firm grip, as the two men who were to control the destiny of the Planets looked each other over. "I believe you've been a hard-pressed man, and I appreciate the honor you have done me in coming to me, instead of asking that I come to you. Believe me, there was reason."

"I believe you, and—it was only right for the student to come to the master, for you are surely the master in warfare of this scale. Never have I felt so completely my lack of capability. I have been trained in a school that taught warfare against pirates and smugglers, not vast battlefleets. And I understand you have already met the enemy—and that faction at least is yours."

Aarn chuckled. "I suppose so—if I wanted to gather them up from the several billion cubic miles of space they now occupy. Space war is surprisingly final in its destruction.

"But—come inside the ship. I want you to meet the other gentlemen, and I want to meet the whole party with you."

"Oh, I beg your pardon. Let me introduce you—"

Half an hour later, the *Nova* rose from Earth. Aboard her were all the men who had come with Commander Barret, the Commander, and Aarn's own party. Swiftly the *Nova* left Earth behind, shooting out to her rendezvous with the Magyan ship, far out in space. In ten minutes she had reached her place, and in five more, the *Sarn Magya* loomed gigantic beside her.

Canning took charge of the *Nova* while the others transferred to the great Magyan ship. In stupified surprise, the Terrestrians examined the titanic thing, a city, floating in space. Behind the four-foot metal walls were the heaped machinery and piled apparatus of a great war machine—and the men who ran

it. The perfectly human Magyans, perfectly human because they were human, the other branch of the human race, lost since the ancient continent we know as Mu sank beneath the Pacific.

Anto Rayl met them, and with him were five of the ten members of the High Command of Magya. Ceremoniously they were welcomed aboard. Then with the efficiency of a long-trained war-machine they got down to the business of planning.

"It is unthinkable," said Karth Maryl, the head of the Magyan High Command," that we should not aid you. That is obviously the primary premise. Now let us see what may be done. Obviously, the Magyan fleet must come through as rapidly as possible. We had largely left off our work on the fleet since the Tefflans were destroyed, but now with the greatest possible speed they will be equipped to fight in this new battle of new weapons.

"And," he smiled, "we are ably equipped for such action. Our machines are in advance of our man-power. I suggest that a force of your men be sent to aid in the construction, and that your enormous productive machine be turned to the task not of producing warships, but of producing warship-making machinery, to which it is better adapted."

For three hours the discussion was carried on, details being settled, ways and means calculated—

And the Magyans, who for ages had known only war, and the economics of war, did not discuss costs and labor bills. Costs, to them, were those things needed to maintain production. The population works without costs when it works to save its life.

At the end of three hours, another giant Magyan ship appeared suddenly, mysteriously beside the *Sarn Magya.* Anto Rayl smiled. "The *Tarth Magya*—our sister ship. They said they would equip it soon. More will be along directly."

Two hours passed, and another materialized. And shortly thereafter a flight of the Invaders, led by three battleships, appeared, a flight of twenty cruisers. As Aarn had instructed, the *Nova* vanished, falling back into Magya's space. The *Sarn Magya* followed for the seconds necessary for Aarn, Spencer and Carlisle to transfer. Then both reappeared.

The Magyan battleships were holding their own. Their new equipment was functioning perfectly. The instant the two other ships appeared, the scales of battle were turned definitely. All the *Nova's* beams concentrated suddenly on the cruiser nearest her, and, driven by material energy, they smashed the screen of the ship in seconds. Swiftly the *Nova* turned, and another fell. Another—

The *Nova* destroyed one more, this time when Aarn turned loose his space-cups. Then there were no more in the neighborhood to attack. They had fled, leaving a destroyed battleship, and seven disintegrated cruisers behind.

At the end of the battle, Aarn looked thoughtfully at his chronometer. Then he turned his telatoscope on the *Sarn Magya's* council room. His image appeared, and spoke. "I think you will see something highly interesting out in the neighborhood of Pluto presently. I'd advise you hang off at least a million miles, and watch. Something will happen shortly."

The *Nova* vanished in speed greater than light as it shot across the vast gulf that lay between them and Pluto. In minutes, though, it had reached the outpost of the system. From a million miles, even, the works of the Centaurs were visible. Ten great asteroids circled about the planet, and from one of them a great beam reached down to the sun, tapping the power that ran the war machine of the Invaders. On the planet, menacing fortifications reared ugly heads among the frozen oxygen glaciers. The far-off sun was a first-magnitude star here, no more.

The radio questioned as the *Sarn Magya* appeared near the *Nova.* Aarn did not answer, only smiling into the television disc. Spencer answered annoyedly. "He's got a silent streak on. He won't tell us—only says—*Uhooo!*"

Aarn's "something" had happened.

Where the Invader's power satellite rode, where the vast transpon beam that reached to the sun ended, there was an explosion. In the briefest conceivable fraction of a second, the power satellite was an enormous, explosively spreading cloud of deep violet gas, that changed abruptly, and flared in a thousand

mingled spectral lines. The energy that welled up from it seemed to increase, second after second, and a great spurting beam flared forth, fountain of radiation so inconceivably intense that no substance in the universe could have resisted for the briefest fraction of a second. At the moment of the explosion, the power satellite had been transiting the sun as seen from Pluto, so the inconceivable beam of energy smashed through the infinitely hot gases that had been the planetoid, and sprayed in spreading, awful destruction across the face of the frozen planet.

The surface of Pluto exploded upward under that lash with a rush of ultra-incandescent gas that drove out at miles a second into space. The spurting column of solidified radiant energy plumed outward, nearly five hundred miles across now, where it had been one, and still that unutterable intensity endured. Like moths flaring for an instant in some cosmic flame, four of the remaining planetoid forts flashed star-bright for fractions of a second, and added to the titanic, growing gas cloud.

It seemed hours that that frightful flame, a flame of released energy beyond human conception, endured. Slowly it grew, spreading wider and wider, till all the sunward side of Pluto flamed horribly in it, and finally two of the planetoid forts revolving well out from the planet glowed instantly white, but remained molten droplets of matter, as the diminished intensity of the wide-spread flame failed to volitilize them.

For age-long seconds after the flame had died abruptly to a mere spouting flare of an ordinary cut transpon, the men in the two ships stared utterly silent at the scene. Pluto, Pluto the Lord of Outer Darkness and cold, glowed on all one side with a fiendish, unbearable flame of violet light. Pluto had a vast, spreading atmosphere of incandescent gas, a flame that burned slowly blue at the edges, and crept about the edge of the frozen planet, spreading the sudden and terrible thaw that had struck it. At the first touch of that thin blue flame, the great glaciers liquified, ran in streams, and vanished in the sudden hot atmosphere.

Aarn spoke first. "That's one base they won't use. And they're set back a whole set of planetary forts. Quite a display,

wasn't it."

"God in heaven—yes!" gasped Spencer, breaking an awe-struck silence. "What in the system did that! I didn't think there *was* that much power."

"I did it," admitted Aarn modestly, "I did it with my little hatchet. I tapped their telegraph line. I stuck dynamite in their fuel tank. In other words—I shot a special beam I've worked out into their transpon—and *short circuited it!*"

"And a short circuit on a transpon," said Spencer softly, "is the signal for infinite power—and the other end of that beam was attached to the sun itself. So *that's* what darkened the sun. Great Galaxies—no wonder that place blew up! At least fifty percent of all the inconceivable energies of the *sun*—concentrated in a beam."

"The beam broke down though," said Aarn in a slightly disappointed tone," when the power station blew up at this end. If it had held together—it might have put a hole clear through Pluto."

Spencer snorted. "Put a hole through it—blown it clear out of the System. How long did you short that beam?"

"Two minutes. I thought it wouldn't be safe to short it longer. Old Sol is near the edge of the G-O line, and it might have made it unstable altogether. As it is, it may be slightly variable for a year or two."

"Two minutes—and Sol releases energy at about the rate of four million tons a second. Say they got only one on that beam. That's—*one hundred and twenty million tons of radiant energy!* Why—it's a wonder there's anything there at all!"

"No, not really. Most of that energy was radiated away into space, remember. And it had a great deal of matter to work on. Whoa—I see the enemy are peeved. They're coming out."

The enemy were. Those that were left were soaring up from the dark, protected side of Pluto. But they didn't attack. They raced for Neptune instead.

"They have another base on Neptune," said Commander Barret's voice in the loud speaker. "You can't do the same for

that, can you?"

"No, 'fraid not. That's a one-shot gun. They happened to be using a special type of transpon that picks up both polarities simultaneously. I found out how to do that recently, and also saw the difficulty. It's got advantages, because a smaller apparatus can handle more power. But—the other fellow may overload your system for you."

"Can't they do it to our beams?" asked Carlisle.

"No, for the same reason we won't be able to do it to theirs any more. They'll use a pulse beam, that will pick up the two polarities separately, and so can't be shorted. Alternating current sort of thing. It isn't even that, it's a series of separate waves of power, no two interconnected, and so can't be shorted. It's too bad in a way, because we can get along without beams, thanks to material energy, and they can't, I suspect."

"We are apparently going to get rid of them pretty soon though, and that's a comfort. When the Magyan fleet get's through, handicapped as they are now, without the planetoid forts, and with an incompleted base, they should be easy to drive out."

"Don't believe so, Spence," Aarn replied soberly. "I'll bet that was just an advance squadron to break ground. I just have a hunch that any race with that gang of weapons is all set to use them, and has the ships to carry them with. Just think of the spats we got into before we developed the stuff we have now!"

"Then you think they have a bigger fleet than that?"

"I *know* it, Spence, I *know* they have."

CHAPTER FOUR

THE SOLAR SYSTEM WAS, AT long last, politically united. That was not difficult, so far as the planets were concerned, meaning by that, the colony planets, Mars, Jupiter, the Jovian Satellites, and Venus. But Earth was the great task. Through the centuries the nations had maintained their petty independence. The questions that had troubled Europe for centuries, France's eternal plea of "security"—Russia's touchy "sovereignty"—had remained to trouble the union of Terrestrial nations. When the enormous magnitude of the trouble first became apparent, England, and her colonies, and the United States and Germany had arranged almost instantly to submit their combined powers to the central control of the Planetary Patrol, the only experienced organization of space fighters.

The data and reports, the stories and pictures that Aarn and Spencer had turned over to the Planetary Patrol when they returned from their involuntary cruise had been of inestimable value in these first days of the war. The Heavy Metals Company had already begun turning out the new material engines, as well as a few telatoscopes. These were requisitioned instantly. All machinery manufacturers had been diverted to producing what parts they were best fitted to turn out, and the flow of engines had been enormously increased. Aggie coils, and transpon beam apparatus was ordered in unlimited quantities at the maximum production rate.

The Planets of the System realized more clearly than ever before, that War was not a battle of men and machines half so much as a battle of production. Certainly this was so at the beginning. And the enemy, very evidently, had a head start.

Then came Magya's offer. And Magya's ships. Most of all, Magya's production machine, an economic system geared for war-time production for not mere years, but for generations. They knew the secrets and the details of war-time production as no Earth-race ever had. Earth had never experienced a war of machines and production on the present scale. Any Earth statesman, any statesman of the System, could have stated the general rules to be followed—but a general rule is of little help. It was the infinitude of detail, never before calculated on, that had swamped them.

Magya knew all those details, all the laws and regulations they must follow. And best of all, had the actual physical equipment, the huge ways and cradles to produce great battleships.

The enemy had left, after the destruction of their base on Pluto, and for the next two weeks, Magya concentrated on the terrific problem of uniting two worlds in two different spaces into one production machine. Magyan battleships were converted to making the inter-dimensional trip readily, and before that period was up, all Magyan battleships had made the crossing at least once as had many of the cruisers—and all of the supply ships. A supply ship came through loaded with Magyan technical men, and economic organizers. It went back loaded with trained and untrained laborers of Earth's production army.

The ways of Magya's ship-building plants were roaring again. And men from Earth and Venus worked there. Magyan pilots were training men from heavy Jupiter to pilot the great battleships. Every Jovian would find his task in such work, for these men, used to a planet where gravity was more than twice as intense, could, like Aarn, move more than twice as rapidly. They made excellent pilots.

Aarn was busy, not yet in his laboratory where he longed to be, but in the greater problems of hitching his science to production. Spencer, the one man in the Universe best able to convert Aarn's ideas to plans that other and lesser engineers could follow, was with him constantly.

Enormous plants had to be erected at break-neck speed. But

while the problem of masses was a great one, the problem of accuracy was of equal importance. There simply weren't the requisite number of men capable of doing the exact, accurate work of making instruments.

Magya became the center of the production of the actual massive hulls; and Earth the center of production of material engines, telatoscope apparatus, instruments.

One thing that might have troubled them troubled them no more. There was plenty of metal. The Magyan supply ships, with great momentum-wave tractor beams at work, dredged in millions of tons of nickle-steel asteroids—nicely refined metal of excellent quality. Mighty Anrel supplied the energy that fused it, cast it, and rolled it to the five-foot thick metal plates, the gigantic girders and braces, the bulkhead walls and doors.

But also—ten great resistium furnaces were being set up on Magya. Resistium, the artificial metal Aarn had invented, was to be the ultimate, outer skin of these ships. Two feet of the incredibly dense metal! Every cubic inch was over one hundred and twenty five times as heavy as a cubic inch of steel—and over one hundred times as strong, but concentrated strength. The greatest importance lay in the fact of that density, and the atomic weight of over four thousand, since it would stop the gamma rays of the Centaurs absolutely dead at the surface.

But—it was made of neutrons, negatrons and protons. Neutrons from heavy water, heavy hydrogen of atomic weight two, negatrons that could be found only in a sun, and common protons.

The resistium that sheathed the *Nova* had been made on Cornal, the planet of the Tornans, where heavy hydrogen was peculiarly plentiful. Here, it was not plentiful, nor was it on Earth.

"That's a problem we'll have to solve all right—but—I think I know the answer," Aarn replied to Spencer's questioning. "Remember, the neutron is a negative sort of thing—not only electrically, but grammatically. It's *not* charged, it's *not* easy to control, it's *not* a lot of things. Principally—it's *not* ac-

tive. And not re-active. There's plenty of energy there, of course, but it's entirely latent. I have an idea that it may be easy to find elsewhere.

"But as to the negatrons—Anrel will be far richer in them than is old Sol or even Torka, where we got out our original supply. Remember, negatrons are rare on planets, so rare they're practically non-existent, because planets are made of ash-elements; but Lord knows—Anrel certainly isn't made up to any great extent of such ash elements. Anrel's one titanic roaring furnace of super-active and super-heated matter.

"So naturally, Anrel is rich in negatrons and positrons. It will be a rich supply-base for them. The stars of this space will not however, be rich in neutrons. The neutron is peculiarly inactive.

"If Anrel's our source of negatrons, then a trip to Anrel is indicated," Spencer replied. "The furnaces will be ready in a day or so now, and they'll need raw materials. In the meantime, how about neutrons?"

"I'll get them," smiled Aarn. "And though I'd been planning on some research, I'll make a trip to Anrel right now for those materials. Want to come along?"

Half an hour later the *Nova* swept up through the burning, deadly atmosphere of Magya, and out into free space. One and a quarter trillion miles away, Anrel, the super-giant sun of this system burned in fiercely angry violet heat. The *Nova* pointed toward it and abruptly the great star grew hazy as the ship slipped half into the fifth dimensional space for speed. In so huge a system, even the enormous speed of light was so small as to mean hours, days of travel from Anrel to Magya.

The *Nova* covered the distance in minutes. As they flashed nearer and nearer, the fierce radiation became more and more intolerable. Aarn flipped over a tumbler, and great relays thundered over. Abruptly Anrel became dim. The *Nova* was surrounded by a sheath of force that converted the incident electromagnetic light and heat to the ultra-penetrant gravito-magnetic

radiation that passed unhindered through the ship, without heating or any other effect. Only a slight fraction of the light was permitted to leak in so that they might see.

Nearer and nearer the *Nova* swept, slowing at last to normal space at a distance of less than ten million miles. Anrel, five hundred million miles across, filled all the heavens now, one vast sheet of blistering blue-violet flame. Great bellying prominences soared up three hundred thousand miles toward them, sheets of flame that could have wrapped a world, and dissolved it in gas. The *Nova* plowed on unhindered. Rushing electrons, hurled from the terrific furnace, constituted a resisting medium now, and a sheet of them, glowing dimly, obscured the direct light vision. Aarn completely closed his invisibility sheath, and relied solely on the telatoscope.

The *Nova* was a tiny dark splinter near a vast flame. On the momentum drive now, it approached steadily, till finally, the tip of one of those vast prominences flipped suddenly about it. The *Nova* roared with sudden wild energies as her transpon beams carried power to the drive in vaster amounts. Aarn's fingers flew over the controls, a new roar sounding as he drove his transpon pick-up beams down, to gather power from the sun as he worked. Anrel would fight itself.

The invisibility sheath opened a bit again, and the screens showed a single vast wrapper of violet flame rushing past the *Nova,* an incandescent wall that slid smoothly past on the surface of the magnetic and anti-gravity fields that protected the ship. The outside coat of resistium was glowing faintly red, but the cooling beams within the ship were absorbing the energy, transforming it to electric power.

"This," said Aarn grimly, "is distinctly worse than taking stuff from the sun Torka." He paused as his fingers worked swiftly on the controls. "I'll have to get a lot deeper, really—and this prominence is rushing out most uncomfortably—it's taking all the power I can use."

Doggedly the ship plunged and bucked on her way. They were still boring in at a speed of miles a second. With all her

vast power flowing, and gathering all the energy the great transpon beams reaching down to Anrel could carry, still the resistance of even this nearly perfect vacuum of the prominence was terrific, for it was leaping outward at a speed of nearly 200 miles a second. Aarn could have avoided this prominence, but later he would need its help.

"We're about two hundred and fifty thousand miles in now," said Aarn at length.

Carlisle frowned uneasily. "So far! We'd be half way to the center of our sun with that distance. How can our fields stand the pressure?"

"There—isn't any," replied Aarn jerkily. "The thing's like Alice in Wonderland. You have to run hard to stay where you are. The light-pressure is so enormous it more than counteracts the inward pressure of the gases. It's dying out—being about balanced. We'll make time now." The rush of the prominence had slowed visibly as they approached its base. Now they were entering the region where the normal gravitative pull overcame the outward drive of the light. Presently the speed-indicator began to move up from five where it had been held for some seconds, toward ten, then a hundred, and finally one hundred fifty. At a hundred and fifty miles a second they were shooting toward the heart of Anrel!

"How can you do that?" asked Spencer. "Plowing through the matter of a star at any such speed."

Aarn's grin was grim. "Why not? Do you realize I'm using about three quadrillion horsepower? And that the atmosphere of a star is a more perfect vacuum than man ever created? That is, by pumping, not by exhausting into space. We'll have to stop soon though. The only reason I can go on now, when the pressure is really mounting—since Anrel's surface gravity is nearly 214 times Earth's—is that the fields are taking the strain. You can't compress a magnetic field—it just IS. But pretty soon now I'll meet destructive fields that'll tear mine down—ah."

Aarn had. The magnetic and gravitic fields of Anrel had been met. They had penetrated the "cold" layers of the star's

atmosphere, the reversing layer, and were in the terrific fields of the photosphere. Instantly it seemed, the *Nova* was howling and shouting in protest. The ship stopped almost dead, and shook like a rat in a dog's grip. Aarn backed them out a distance, till the *Nova* calmed a bit. Then again the howling roar of the beams began. The *Nova's* mighty tractor beams were reaching down, down into the heart of the star where the ship could not penetrate, where no material thing could reach.

"We're about six hundred thousand miles down now," Aarn said. "The beams reach about half a million more."

For some time the grim, noisy battle within the ship went on. Gradually a frown came over Aarn's face as he looked at his instruments. He sighed. "I can't lift it. My beams open up when I strain on 'em. Spence, send in a few anti-gravity bombs to open out at—" Rapidly he read off the coordinates.

A new roar added to that already existing. A periodic roar and crash of transpons. The *Nova* began to shudder again as, with the aid of the bombs which tended to break down Anrel's grip on the matter, the beams gripped, tugged, and with a mighty straining of ship and beams, dragged it slowly, slowly back.

Nearly an hour passed, then slowly, on the screens appeared a spot of light even more incredibly radiant than the flaming photosphere itself. It actually outshone even that impossibly brilliant surface, a surface in fact twice as brilliant as the visible surface of Anrel, since here it was not masked by the "reversing layer" above it. This was not merely photospheric matter, but matter from the incredibly hot radiant heart of the star; this came not from the exhaust-surface, where Anrel's excess heat was thrown off, but from the generating room itself—where matter was converted to radiant energy.

"That," exclaimed Aarn, "is so hot it's giving off X-rays. I hope it was worth all the trouble."

"How much does it weigh?" asked Carlisle.

Aarn smiled faintly. "Don't ask, Carlisle, don't ask. Its mass is about sixty million tons—but due to Anrel's reluctance to part with it, its weight is about one and a quarter billion

tons. Add resistance of this stuff to its passage and the fact that I need energy to hold it together."

Carlisle whistled softly. "Where's it all coming from?"

Aarn laughed. "The same place it's going—Anrel. I'm feeding on my transpon beams of course—picking up the energy from the sun as fast as I use it."

"Will you be able to make it with all you've got?" asked Spencer dubiously.

"That's why I came in through that prominence. We ought to strike it pretty soon. If we don't—we'll have to drop all that load. Unfortunately, I can't drop half of it."

Aarn watched the screens more closely now than he did his instruments. They were all resting steadily in one position—the limit of their run. The incredible, harsh light from their sheath of incandescent matter remained almost steady, but not quite. Little local irregularities made it possible to determine that it was still sweeping backwards. The *Nova* had turned around as it started out, and this meant they were still forcing their way against the resistance of the more-or-less stable reversing layer.

Aarn's concentration became more and more pronounced. The movement seemed very slow now, and he referred frequently to the velocity indicator. The slowing was due to an actual drop in their velocity. Would they have to drop their hard-won load? It was more visible now. Despite the incredible incandescence of this gas, it was still a gas of almost perfect transparency, and practically a perfect vacuum, so tenuous that no barograph would have registered it. The mass Aarn had captured glowed through it like an evil, ulcerous spot, beside which the intense heat of the photosphere became dark and lusterless.

"We're about stalled—comparatively speaking. The speed's dropped to a mile a second."

"I wouldn't called that stalled," exclaimed Carlisle.

"You would," corrected Spencer, "if you remembered that we have some three hundred thousand miles to go. Personally, I'm not prepared to spend the next four or five days in any such situation. The *Nova's* working under an overload of about 200%

and even she can't stand that indefinitely."

"Besides which it's still dropping," said Aarn glumly. He looked up at the screens, stiffened, and gave a cheer—the matter outside was almost at rest now. That meant that they had reached the under side of the prominence, which would sweep them out with it, effortlessly.

"It's all right—we can make it." he decided.

But it was an hour more before they definitely had made it. Then, with their load of stolen matter, finally caught up in the vast sweep of the prominence, they were almost hurled out of Anrel. With the vast energies of the *Nova* pulling, and the star itself aiding them, in less than an hour they were well out of the star, and in three, were completely beyond the prominence.

But then for hour after hour they had to tow their load out into space where they could work on it. At a hundred million miles, Aarn set to work, releasing the pressure holding the super-incandescent mass together, and a great long stream of the stuff shot out in a blinding arc. A magnetic field gripped at the flying ions, caught, and swirled them, each according to its mass and charge. A gigantic atomic spectro-separator. In an hour he had worked over half of the matter, and closed in his field to maintain the pressure and ionization. In three hours he was finished, and a great ball of the super-heavy elements he wanted floated on his beams, while a tremendous cascade of the lighter, ordinary elements floated back.

Aarn looked at his result with approval. "We must have nearly five million tons of that stuff there! Five million tons of elements above atomic number 100. That'll supply you with negatrons enough for a half-dozen full-sized battleships."

"I still need neutrons," Spencer reminded him.

"And you'll get them." Aarn was busy now, setting up his fields for the return trip. The mass of matter was brought in close to the *Nova,* and spread out so that the fields the ship set up would affect it. Then, faster than light, they swept out to Magya, their stolen matter with them.

CHAPTER FIVE

SPENCER STAYED ON MAGYA. HE had plenty of work to do, not alone with the resistium furnaces now nearing completion, but the more and more pressing task of designing the great new material energy battleships. The Magyan engineers were far more expert than he in the basic problems of battleship design, but still, to him fell the task of remodeling the basic plans for inclusion of the new source of power, the many weapons Aarn had added to his armory while on Cornal, and the appropriate defense machines.

But Aarn had set out for the supply of neutrons he had promised. In the *Nova* he swept up and away from Magya, and apparently vanished.

Aarn did not remain long in this space. He had been spending hours over the calculator machines since he brought back the supply of heavy metals from Anrel. A half million miles from Magya he set his controls carefully, and threw the last triptumbler. With a roar of transpons, this space became hazy, the blindingly brilliant stars whirled and became a mist—and vanished, melting into the less brilliant stars of our normal space.

Canning was with him, in Spencer's place now. Canning swept a look around—then looked uneasily at Aarn. "Dr. Munro —you've missed the sun!"

Aarn glanced casually at the screen. Space was normal but Sol was not there. Instead, a dim, tiny globe gave off a weak, wan light. They did not yet know their distance from this sun, but it *seemed* weak and small. Yet—the light it gave so sparingly

was brilliant, harsh blue-white. Aarn looked at it interestedly. Slowly a grin spread. He looked around at the rather horrified Canning. "No I haven't," Aarn chuckled. "There's old Sol." He pointed to a star showing on the screen simply as a first magnitude G-O star.

Canning looked at it dubiously. "It's a long way off, if that is it. But even so, how can you be sure—there's another G-O off that way."

"Uhm—" said Aarn looking carefully. "I *think* that's Procyon A. You can't see Procyon B from here. But—it may be Centuari. But that's Sol, all right. Look—" The telatoscope went into action. Faster than light it caught toward the distant sun, that was, to all solarians, *the* sun. In seconds, to Canning's joy, the solar system, with the recognizable planets, floated over the telatoscope scale.

"But how did you happen to miss it?" asked Canning.

"Ever stop to think I might have *intended* to miss it?" grinned Aarn. "I headed for this star—and hit it pretty well."

"What is it?"

"Van Maanen's star. Surface temperature, 7000° or thereabouts, radiation being about 1/6000th that of the sun. The diameter is just about 7500 miles!"

"Hm-m—dense, then, isn't it? What's it made of?"

"Neutrons, I hope. That's why we're here," replied Aarn. The telatoscope had shifted its view, and now the *Nova* shot forward at high speed in normal space. With astounding rapidity the star expanded. "We weren't more than 200,000,000 miles out," decided Aarn.

Rapidly the star was expanding, and presently Aarn slowed down as even this feeble star began to emit intense heat and light. There were almost no prominences here, and very little corona. And there were, of course, no planets. So close to the Solar System, astronomers would have discovered the action of planets long ago had there been any.

"Sweet surface gravity on that baby," said Aarn softly, pointing to the gravitometer. Since this star weighed nearly .78 times

as much as the sun, it was about 250,000 times as massive as the Earth—*and smaller than the planet!* That enormous concentration of matter meant a surface gravity that pulled Aarn's instrument, specially designed for reading stellar gravities, almost over to the stop pin—260,000 *times earth's surface gravity!* One cup of water here would weigh one hundred and thirty thousand pounds. Aarn himself would have weighed three thousand seven hundred and fifty *tons.* "I have corrections to make," he decided, looking at the instruments carefully. "We never knew what the mass of the thing was, before. But now that I know, I can say that while the effective temperature is 7000°, due to the fact that the enormous surface gravity just about stops light, the actual temperature is something like 21,000°. *That,* my son would soften the rivets in even this resistium hull."

"How in blazes do you plan to handle anything there?" asked Canning. "We can't get near that."

"Why not? I want to more than ever now. Remember our anti-gravity coils can overcome that."

"They'll burn out," declared Canning, aghast.

"They won't contain an erg of energy. That's the point, remember. They flatten out space, and cancel the energy that the sun has concentrated, at the point where they are."

"This ship," said Canning, "weighs three quarters of a million tons even on Earth. That's 6025×10^{10} tons here. Those figures are positively astronomic."

"You'll see some wonderful effects," agreed Aarn. The *Nova* was at rest now, her anti-gravity coils neutralizing the terrific gravitational strain of the star. However, as they were still nearly two million miles from it, the acceleration would have been only about six times that of Earth, so swiftly did the inverse square law diminish its effect. Aarn was looking at one of the screens with interest. Beyond the incredibly massive little sun was the usual star field. Aarn pointed it out to Canning, and jumped the *Nova* a million miles to one side. The star-field seemed to writhe and twist, entirely new configurations appeared, stars shifting full degrees from their former positions.

"As I remarked, sweet little surface gravity. It pulled that light clear into an orbit. You know—" Aarn's eyes began to shine with a light Canning new and dreaded. "I think I'll try a stunt. It's safe enough—"

The *Nova* suddenly sprang into motion, enormously swift motion. Simultaneously Canning shuddered as he heard the power of the anti-gravity field which alone had been supporting the *Nova* turned out of the coils, and into the aggie coil bank. Aarn was cutting the supports out from under the *Nova.* And the momentum waves were driving her straight toward van Maanen's star with a velocity that mounted exponentially. Canning groaned and turned a bit pale. Aarn was putting the *Nova* into an extremely eccentric orbit that would brush the very surface of the star!

"Canning," Aarn ordered swiftly, "get into the physics lab back there and start in on some routine checks. Check the inductance of the fifty millihenry coil by the balanced capacitance method. Set up a standard synchronous motor, and a generator and see what happens—test your actions by chronometer and electrolytic cell—don't use magnetics to test magnetics."

Reluctantly Canning went back, somewhat white. Aarn's eager eyes were watching. He had shut off all power now, and the *Nova* was a free-falling body; save for her own artificial gravity plant, everything in her would have been weightless. Van Maanen's star pulled at her with the colossal and increasing force of its gravity.

Slowly Aarn saw strange things happen. Rapidly the star neared, and Aarn was forced to throw out his protective invisibility sheath on one side of the ship, that nearest the sun. Light was beginning to play tricks. The shielded sun grew vast, as they neared. Only the telatoscope remained unaffected, and gave the true readings on the distance—they skimmed the surface of van Maanen's star by a bare 600 miles! The ship was moving now at a frightful velocity, a velocity that would have covered that distance in far less time than even the swift-moving Jovian could have moved. But he well knew that the titanic forces balanced

so perfectly now that nothing less than a minor planet could have deflected the *Nova* from her safe orbit.

And as they circled in, under the space-strains of that enormous magnitude, Aarn's eyes darted about with wonderful speed. Stars, their light drawn in abruptly by that enormous field, shifted and bent, till those a quarter of the way round the strange star were visible. The familiar *Nova* altered and bent and twisted under the strange space conditions, the corners twisted into hollows, the control board shifted grotesquely. Only the telatoscope, operating as it did in a level of space beyond even this, remained unaffected, and by it Aarn judged the true state of things.

Suddenly he heard a shriek from Canning behind him—then a wild burst of laughter. Footsteps thudded wildly along the decks, as Aarn rose from his place in one incredibly smooth, incredibly swift motion. Canning, wildeyed, laughing insanely came charging at him, a heavy copper test-bar raised in his hand, mouthing something through his laughter.

Almost invisibly fast were Aarn's motions. The tremendously muscled Jovian, moving faster than Terrestrian-trained eyes could follow, slipped in under the falling bar, and gripped Canning. Gently, the giant pinned his arms and legs. Canning threshed about with mad strength, futilely in the grip of the Jovian. Aarn looked at him steadily, turned his face to him. "Canning," he snapped. "Canning, come out of it, you fool."

Something in the voice, crackling with command, perhaps something from Aarn's mind, trained by masters of telepathy on the far distant planet Myrya, brought Canning under control. And too, the *Nova,* circling on in her wild orbit, was passing rapidly out of those intense, but relatively narrow fields.

Canning shuddered violently, sobbed once or twice, and straightened to look into Aarn's broad, sympathetic face. Aarn smiled at him. "Kind of got you, Canning? The place looked rather weird, didn't it? What sort of results did you get?"

"The results—that was the trouble—they weren't sense—all the laws broke down—even a Wheatstone bridge wouldn't balance sensibly. Nothing worked. The standard cells wouldn't

check their own voltages. Then the walls caved in, and the floor bent up, and the bench turned into an arch, and everything began to slide *up* toward the *top* of the arch."

"Hm-m—I got some readings myself. I'll have to go back to the controls, and stop this orbit first." Aarn turned back to his controls, quite normal controls now, for the racing *Nova* had swept far out again, and normal space laws applied once more. Transpons worked heavily as the power was pumped back into the main anti-gravity device, and the momentum-wave drive stopped the ship's motion.

In a moment Aarn rose again, and went to the recording instrument cases in the power room. Lifting cases from one after the other, he examined the strange records. One new device he had set up only recently was the most interesting—an apparatus which registered by means of a telatoscope image of a glowing light, and hence had been unaffected by the weird fields. Slowly Aarn's eyes widened, and an expression of intense astonishment came over him. "Einstein's gravity—the cosmical constant, by all that's holy!" For minutes Aarn stood in silent concentration. Finally he shrugged, and went back to his controls. "We've got another job to do."

Again they went toward van Maanen's star; this time they went slowly, and without apparent effort and without the strange effects before observed, because now the great anti-gravity coils were damping out that effect. Steadily they approached, and the shielding invisibility screen was arranged so that only the faint amount Aarn needed for visibility struggled through. Virulent, unbearably extreme violet light streamed about them. There was no near-vacuum atmosphere here. Even the enormous light pressure of this incredibly hot star could not lift mass against the awful pressure of two hundred and fifty thousand earth-gravities.

Aarn pressed the *Nova* down, down nearly half a mile into that seething cauldron of impossible flame. Grimly his face tightened as he read his instruments. "That will be enough of *that.*" Roaring transpons agreed. They were feeding the fields, the enormously intense fields that alone shielded the metal ship from

the crushing burden of the gases outside.

Aarn started his great tractor beams. Gently he pulled on them. A soft snort of laughter escaped him. "I can't even shake the stuff—and the beam's torn to fragments before it goes half a hundred miles. I'll take what I can get, here, not what I want."

Time and again Aarn had to try before, at last, his transpons roared, and in answer his beams were able to move. Then began the grim battle of pulling that matter loose. His beams had penetrated successfully only ten miles! In Anrel, a flaming giant millions and hundreds of millions of times more energetic than this tiny star, they had reached down nearly half a million miles!

It was three hours before Aarn had drawn his load up to the surface of the star, then far enough away so that he could examine it. He laughed, and Canning stared in astonishment. At the end of the beams, beams into which hundreds of billions of horsepower had been poured, a mass perhaps ten feet in diameter hung, a little mass scarcely as big as a private wave-car for terrestrial use.

"Is *that* all you got?" Canning stared.

"No comments, please," laughed Aarn. "Let's investigate first. Do you notice the color?"

"It's so hot I can't see whether it's hotter than the star or not."

"Hmm—it is rather violet—also violent. It's trying to burst that beam."

"What does it weigh?"

"Plenty—that's all I can say. It's rather concentrated."

At a hundred million miles, Aarn stopped to investigate. Gravitometer readings, checked against his traction readings, finally told the story.

Aarn looked owlishly at Canning. "My friend, you have no idea. That has a ten foot radius. That means some four thousand cubic feet, and each cubic foot of that stuff weighs just about five hundred *tons.* I mean, of course, has a mass of five hundred tons. Because every cubic foot, acted on by the sweet little gravity of that vest pocket star, *weighs* one and a quarter

hundred—million—tons. So the total load the old *Nova* was moving against was about five hundred billion tons.

"Sneer not, my lad, at the morsel we chewed out of that baby. Grim Death never held on with a gravitational acceleration of eight million feet per second per second." Aarn looked down at his "morsel" with added respect. "Maybe," he acknowledged, "I made a mistake in picking a star *quite* so dense."

Canning was staring at the blue-hot thing hanging on the beams. "That weighs five hundred billion tons. Good Lord!" he said it in a flat voice of utter bewilderment. That little nugget of matter weighed almost as much as a minor planet!

Aarn was busy. He was examining the spectrum with the greatest care. There was a growing air of disapproval as he did so. "The stuff's about fifty percent neutrons, as I expected. But I hadn't calculated on each pound weighing a hundred and twenty-five tons. We need more—I wonder—"

Aarn went into action again. The tractor beams were towing at the thing down there, towing at it with all their enormous power. It took Aarn about fifteen minutes to establish it in an orbit, with the aid of a few score anti-gravity bombs to both reduce the weight and to hold it in shape. It was radiating away its heat now, but the mass was so great, that even at that temperature hours would pass before the stuff could solidify.

The orbit finally established, Aarn returned to the star, and at a distance of one hundred thousand miles, floating on his anti-gravity coils, began new operations. This time, instead of burrowing into the planet-sized sun, he reached in only a short distance with his tractor beams, took a small bite, and hauled out a two foot globe with comparative ease. Then with the transpons of the *Nova* roaring, he accelerated this in an orbit that threw it gradually outward, wrapped in an anti-gravity field.

For several hours he let automatic controls repeat this procedure, while he gathered the hurled lumps on other beams, and thrust them toward his original collection. This grew slowly but steadily to a ball of white-hot matter a hundred feet in diameter. Then Aarn quit.

The *Nova* groaned in protest as it was forced to accelerate the stupendous load of ultra-concentrated matter, dragging it completely free of the star's field. The field declined with fair rapidity, and at a distance of five hundred million miles, Aarn made the crossing into Anrel's space.

"I'd never be able to drag that thing up-hill into our space," he pointed out. "It's only because Anrel's space is the one to which things thrown into the fifth dimensional interspace go naturally, that I can make it."

Even with it, their constants were accurate. Two hours later, the *Nova* with its hard-won cargo, floated in an orbit off Magya.

A cruiser-size ship floated up from Magya, and Spencer's voice came over the radio. "Where've you been for the last week? We were beginning to get worried about you."

"Week?" Aarn repeated. "I've—oh, lord! I know what it was now, I'll bet. Was it a full week?"

"Six and a half days," replied Spencer. "What happened? The resistium furnaces have been started, and we wondered if you'd been ruined somehow."

"No, but our time-rate was. I went to a super-super special kind of star for my neutrons. There they are."

A finger of light pointed toward Aarn's collection. Spencer's disparaging voice answered, "It certainly doesn't look like you made much of a haul."

Aarn laughed gently. "About ten quadrillion tons, where I just came from. I've been where there was a real gravity—a hundred thousand times that of my home planet."

"A hundred thousand times *Jupiter's* gravity? Say, what kind of a star was that? It must have been a billion miles in diameter."

"It isn't," Aarn replied. "It's within a few light-years of Earth, and it's smaller than Earth. Van Maanen's star. Now look out, I'm going to open out that load I brought in. Can that ship you're riding handle it?"

"It can," replied Spencer emphatically. "It's a new type

ship, refitted for getting matter from Anrel. It'll handle anything the *Nova* will."

Aarn's collected matter had at last cooled. It had solidified now, and as Aarn withdrew the forces he had been using, it hung cold, dark and lustrous. It was dully silver, its surface frosted from the slight degree of freedom the crystallizing process had been allowed in Aarn's fields.

Aarn turned his telatoscope on Spencer's control room. A young Magyan was the pilot of the ship; Spencer was operating the beam controls. Aarn watched with a spreading grin as Spencer negligently turned on the beam at low power. The mass of matter, scarcely one hundred feet in diameter, should, according to Spencer's view, have leaped forward under the drive of that beam. It didn't visibly budge. Spencer frowned, and turned on more power. The mass didn't seem to notice it. More and more power he turned in, and the only visible effect was a deepening frown on his face. Aarn's laughter interrupted him. "Now laugh at my cargo. It averages forty percent neutrons, and weighs five hundred tons to the cubic foot."

"My humble apologies, Aarn. I thought our furnaces were going to use it up in two hours. They'll run two months on that."

"They will," agreed Aarn. "And Spence—the first two months you might run them making a ship for me. You might run your brain overtime trying out various plans for a battleship. I want a super-battleship. This *Nova* is about the last and hottest word in cruisers, but it is only a cruiser, and now the enemy have nearly everything we have in battleship size, I'll need it if I'm going to do as much as I can."

"Proud of yourself, aren't you," suggested Spencer. "By what right do you claim a private battleship at a time like this?"

Aarn grinned broadly. "I have reasons—good ones. But there's no great rush. I want to do some more work anyway. You say I've been gone a week, and that means something must have happened back in our own space. What?"

"Nothing—only they've got all the little nations on earth running around chasing their tails. The grand old nationalistic

idea seems to be dying a hard death. Only it just so happens that everything everywhere on Earth has been taken over by a bunch of Magyan engineers and lay-out economic planners who can't understand what a nation is and when they say 'Do that,' it means there's something that's got to be done if you have a hankering to go on in this vale of tears or whatever you want to call it, and you're the logical one to do it.

"The last trick they pulled was one no Earth-statesman could have gotten away with. They moved half the miners out of Europe and set them down all over the world. Europe's full of a lot of almost useless mines of all kinds that they've been working so that each pretty little border can be surrounded by a wall of steel. They made Europe stop growing wheat to a large extent, tore out a lot of machine shops in Europe and set them up in the American fashion, and moved half the population of China over here on Tharnt. They've set up a colony there—subterranean by the way—and they've got the Chinese working at such problems as the coolies can understand. By the time Magya gets through with old Earth, they'll have the nations so mixed up that no nation can fight another because every nation will have most of its nationals somewhere else. They've got most of the skilled mechanicians in America and England and Germany; the chemists divided fifty-fifty between America and Germany; most of the Earth's weavers in England and America; and Australia's being populated rapidly by farmers moved from elsewhere.

"Before any nation can agree to the idea, the thing's been carried into effect. Those Magyans are moving."

Aarn suddenly roared with laughter. "I can imagine! What a time those diplomats must be having with that bunch of Magyan production engineers!"

"You don't get it, my friend—you miss the point. The Magyan production engineers aren't even going near the diplomats. They work everything out with the Terrestrial geologists, engineers and production experts. They're using their big freighters to carry materials around, and flying so high, and landing so fast and unceremoniously that the tariff departments have just

given things up as a bad job. The various governments are getting around to cancelling the tariffs 'for the duration of the emergency' at last."

"Ah, sweet bliss," sighed Aarn. "What's happening on Mars and Venus and Jupiter?"

"Nothing much. A lot of Terrestrials have been moved to some of the Martian and Venusian mines. More effective machinery going in on Jupiter, delayed by the fact that only brainless gorillas like yourself can stand the strain of gravity for any length of time. They're prospecting the planets by telatoscope."

"Say—what are they looking for? What elements? Where are they getting iron—?"

"Thought of that myself, Aarn. Iron, some of the other things—all from the suns—both Anrel and Sol. They're looking for chromium, tungsten, platinum."

"Try van Maanen's star. Probably loaded with heavy elements. They'll know how to get there. Carlisle, I want you to help me. I'm going to give you some dope, and you can shoot it along yourself. I've got some work of my own to handle."

CHAPTER SIX

"IT'S A NICE LOOKING PLAN," said Carlisle, looking at the drawings Aarn and Spencer were working over, "but there's an awful lot of blank spaces on it, for a finished blueprint."

"Semi-finished. For one thing," said Aarn, "I've been waiting for a report from you. For another, we're leaving a lot of room for improvement, one might say."

"One might," agreed Carlisle sourly. "According to the figures there the blasted thing is almost a mile long. So far about three quarters of it is drawn in. That still leaves enough 'room for improvement' to put an average city block of buildings in. What sort of improvements?"

"That empty space is not lumped, as your analysis suggests. It's scattered. Much of it is in the section containing the telatoscope apparatus, and the weapon and screen rooms, and a lot is here, there and everywhere. You notice I have aggie-coil banks all over the thing, several dozen miniature material energy plants—each by the way, slightly larger than the *Nova's* original equipment—and also five separate control centers." Aarn paused. "Not that I want to change the subject—but have you come to make a report?"

"What's the rest of the space intended for?"

"Apparatus I'm working on, and will work on in the future. I have the pleasure of announcing I've battered my head on the hardest stone wall in the universe—or universes for that matter—for the last three weeks, trying to solve the apparently insoluble. Did those last figures I gave you help any?"

"Uhmmm—there's some new stuff. Try it." Carlisle handed Aarn a curious bakelite box with a series of coils mounted about it. The lid was free to open, and on doing so, Aarn saw a piece of roughly shaped, jagged metal plate. The metal was a beautiful sapphire blue; it would have been taken for glass but for the curious, typical metallic sheen and luster, and the opacity of it.

"It's pretty, I'll acknowledge that," said Aarn solemnly. "Is it good to eat?"

"Uhm—never tried it that way, but I think it would be a bit heavy on the stomach. Also a bit indigestible. I started to bring it over here in a hand truck but Marth Lano devised that little case for it. Pick the thing up."

Aarn reached into the box, and felt the curiously twisted strain of an anti-gravity field repelling his hand. "How can I?" he objected. "Where do you turn off the field?"

"Set it down first. You may be a brute, but you aren't that much of a human derrick. There's about forty-five cubic inches of the stuff there."

Aarn placed the box on the bench, and then cut off the anti-gravity field. The stout metal bench creaked sharply. "Sounds hefty," he observed. He reached in easily now, and tried to force his fingers under the bit of metal. He pinched harder. Finally with all the tremendous strength of both hands he lifted it a bit, got both hands under it, and with even his giant arms cracking under the strain of the apparently insignificant bit, placed it on the bench beside the box. Aarn grunted appreciatively. "It's heavy, Carlisle."

"I might reply you've got more beef than I thought you had," grinned his friend admiringly. "At that angle—and it weighs slightly under half a ton! Density about 760. They don't make instruments to measure that. But your theories were dead right. It did just what you said."

"What is it?" asked Spencer, examining it with interest. "Some new ultra-element?"

"Resistium is the hydrogen of the ultra-elements. Nucleus

of protons, electrons, and negatrons, with one orbital proton. I suggested to Carlisle, our chemist and metallurgist, that he try his metallurgy on a few ultra-elements and see what he got. What did you?"

"I tried ultra-helium, and the blasted stuff was actually gaseous!" Carlisle exclaimed. "It acted like a gas, at any rate, but what a gas! Density several times platinum—and gaseous! I tried ultra-lithium, and so on, till I finally made some ultra-beryllium. I guess that's what you'd call it. Anyway, it was made with four orbital protons. Fine, stable, strong stuff. My resistium tools wouldn't touch it. Then I tried going higher. You heard about our explosion? That was ultra-oxygen. Those blamed ultra-elements aren't at all inert, though their reactions are curious. I made ultra-water accidentally, because, foolishly, I was using resistium chambers to handle the stuff. Funny—the stuff's a liquid at a reasonably low temperature—around three thousand centigrade. I'm wild to work on it. But, martyring my scientific interest to practical considerations, I tried some other things.

"Remembering my mishap with the oxygen, I didn't try playing with ultra-flourine, because the ultra-helium was gaseous. I couldn't make a chamber out of that.

"Leaving out the development work, I got as far as u-magnesium. That's the answer. The blamed stuff kept getting worse and worse to work with, heavier and heavier. Magnesium's got twelve orbital electrons—this has twelve orbital protons, and that meant an atomic weight of about twenty-four thousand. Slightly unstable. I quit. None of the things had much better properties than the resistium, though the u-beryllium was a bit better, and not impossibly difficult to make.

"Then I tried an alloy. I had resistium, u-hydrogen, u-lithium and u-beryllium that I could work with.

"Aarn, there's one thing you never thought of. What's the melting point of pure glycerine?"

"Eutectics, you mean? I know the old paradox—glycerine, pure, melts at 62° above zero Fahrenheit and water at 32° above, but they use it as an anti-freeze solution in laboratories

because the mixture freezes at thirty-eight below. Eutectic mixtures always freeze lower than either of their components."

"Ah-ah—not always. Sodium and potassium, neither a liquid at room temperature, form a eutectic mixture that is—but u-hydrogen, melting point about 25,000, centigrade, u-lithium, melting point 29,000, and u-beryllium, melting at plus 44,000 centigrade, form a beautiful sapphire blue eutectic mixture melting at plus *seventy-four* thousand. Negative eutectic mixture."

Aarn whistled softly. "How sweet. How in blazes did you fuse it?"

Carlisle laughed. "I demand credit for a new stunt—they're going to install it pretty quick in a lot of the furnaces. I grabbed a hunk of the heart of Anrel in a telatoscope—and that durium—that's what I called the alloy—just melted like water."

"Right enough," Spencer nodded. "Aarn has a similar use for the telatoscope we're working on. Show you later. Go on."

"Well, that's about all. Except I found I could heat-treat it for greater strength. Tensile strength runs about eight million. The heat-treating, however, is at a temperature of a mere 64,000. I don't think anyone will take the temper out of it."

"I'd like to make a really hard ultra-metal," sighed Aarn. "Iron, or tungsten."

"That would be hard enough," agreed Carlisle sourly, "to make. It'd blow up in your face."

"I guess so," Aarn smiled. "You say the ultra-magnesium was radio-active?"

"Yes—and it shot out positrons!"

"You must have had a lot of neutrons in it. You couldn't keep them out of an artificial metal of course—need 'em. May try it again later, though. What are the other properties on this stuff? Can you make it fairly easily?"

"Well—comparatively. It's not a lot harder to make than resistium, and it reacts peculiarly to electric currents. It—it seems to twist them. That's why I want you to work on it."

"Hummmm—that's interesting. I will," agreed Aarn. "In

the meantime that's the data we've been waiting for. I'll make some more tests on this with Spence's help. You can get the Magyans started on making it here, and take a flying trip with us to earth tomorrow, and make some data sheets for the Heavy Metals organization to work over."

Together the rest of the day, the physicist and the engineer tested the physical properties of the metal from an engineering standpoint, in connection with the new battleship, and then Aarn took it while Spencer worked out figures on the ship, to make some calculations and observations relative to the interference it might cause in the mechanism of the ship. The steel explosion ray, which released the molecular bonds between steel crystals, turning the metal into a gas under hundreds of thousand of pounds pressure, was combatted, as were certain other weapons, in the resistium hull of the *Nova.* If durium acted differently, some changes were called for.

Durium responded correctly to most forces—it would replace resistium almost everywhere. But—electric currents did strange things. A current put in at one side of the plate simply was not detectable on the opposite side. The current would not travel rectilinearly through it. It turned through ninety degrees in a thin plate, and through some multiple angle in a thicker plate, the thickness and the frequency of the current making it possible to have a single-wire short-circuit!

Aarn settled down to immediate and serious business. He annealed the plate, working with a telatoscope image of Anrel's flaming heart as a heat source. The characteristics were entirely altered. It conducted normally. Following Carlisle's methods, he heat-treated it in various ways. He poured it into a film-thin plate, and finally attempted to draw it, only to discover that it acted exactly like a piece of rubber when fresh and active. It would stretch to the elastic limit, and snap back instantly with the clang of an anvil struck by a heavy sledge. Stretched more, it did not change shape. It broke. It could not be forged, rolled or drawn once it had been heat treated. Annealed, it could be handled satisfactorily.

At last, apparently satisfied, Aarn went back to the calculations on which he had been working.

The next day, the three returned to the Solar System in the *Nova.* Anto Rayl was there now, consulting with the fortification engineers, and the Heavy Metals company officials.

Aarn dropped Spencer, Canning and Carlisle on Earth, and, alone in the *Nova,* left for a destination he kept to himself.

Within a week of the first attack, powerful telatoscopes had been set up in every observatory of Earth. They were put there so that the astronomers, who knew most about systematic investigation of the universe, and best could spot those tiny signs which would indicate a planetary system, might search for the home of the Centaur race.

They tried, but they were human. Through lifetimes these men had worked with their telescopes, trying, trying, always trying to clear that haze that shrouded the stars, trying to gather one last photon of light that might make the spectrum of that star or the other a bit clearer, so that they might learn to some rough extent where and what and how that star was and acted. The optical image of the stars meant so little to them, it was so poor, that they had learned by hard-won experience, and mathematics of inspirational brilliance through all the time since Galileo first turned his tiny telescope on Jupiter, how to make the spectroscope tell the story. Before the telatoscope they had squeezed, it seemed, every last particle of information out of the spectrum. Before 1950 they had been able to tell how big the star was, how hot, how distant, its direction of motion, its speed of rotation, its shape, its density, whether it had a companion or not, and a thousand other things, not from the image of the star—but from its spectrum.

These men who, from grim necessity and the driving hunger to *know* had squeezed from a series of dim, blurred lines on their plates, all this information—were given the telatoscope. Stars—the vast, incredible super-giant stars, blue-white and inconceivable in their energies—became perfect working models in their labora-

tories, to be examined with microscope, high-resolution spectroscope, camera and rule at will, with utter ease. Stars—tiny, impossibly dense things, red as dying coal, a hundred, a thousand times denser than platinum; mysterious and unseen in their dimness—rested on their laboratory benches. The very heart and kernel of the suns of space lay exposed to their instruments under the most ideal conditions.

Every star in the universe lay ready to be examined with perfect ease — the weirdly mysterious inner workings of the Cepheid variables, where they could see the Cosmic Stoker throwing on fuel at regular intervals, the vast irregular variables such as Mira, three hundred million miles in diameter, and tenuous as the rarest vacuum man had produced.

They examined the stars of the heavens to find the sun which warmed the race of Centaurs.

They tried, no doubt, to be just, and to fulfill their duty, but to such men, knowledge in the abstract was more than the rather distant thing known as death by cosmic ray, dissolution in a vast flame of energy.

So they searched the Universe, and extended their scope steadily, and carefully, using reason and sense; and because it was not reasonable that a sun of Spectral Class M5 and absolute Magnitude + 10 could warm a planetary system, and because it was a very dim, red star, and quite uninteresting—the star known to a hostile race as Malc was not reported or investigated. They did not see the strange planetary system, or the Double Worlds, Sor-osk and Al-osk. They did not see the vast works going on there.

CHAPTER SEVEN

THEY APPEARED INSTANTANEOUSLY, simply *becoming* in space, where nothing had been. Like lights winking into activity in swift succession, three giant battleships, then a pause, then twenty-one titanic grey-silver shapes, grim, latently quiet. About them, one hundred and seventy-four heavy cruisers *became,* then two hundred and twenty-three light cruisers, then nearly a thousand destroyers.

In perfect formation they swept abruptly toward the Solar System. From Earth rose her seven completed battleships, and rapidly the Magyan fleet began to wink into being as it hurled through space to join in the defense. The battle to prevent the re-establishment of a Solar System base was about to begin.

The Centaur fleet swung toward Neptune now. Pluto they could not hope to use for a base; the whole great planet still glowed dimly red from the inconceivable surge of energy that had bathed it for two long minutes. Neptune and its one moon was their goal. Faster than light they pressed toward it. The human fleets shot out to join them.

There was no tremendous inequality in size of the fleets. Magya possessed nearly fifty giant battleships, Earth, seven already. The battleship is the absolute rock foundation of any warfare; it alone can shatter the charge of all other types of ships. Nearly fifty battleships were in the combined fleets. Five remained on Earth, a rear-line defense; five remained on Magya, in the impossible event that attack might somehow reached Magya herself.

But—the Centaurs far outclassed the human fleets in the heavy cruiser division. And ten heavy cruisers can pull down even a battleship.

A million and a half miles from Neptune the fleets waited. The destroyers went forth first, to test, to feel out the enemy. And each fleet was carefully hiding its worst, unless the enemy already knew it. But—the Centaurs knew all Earth's weapons.

In less than thirty seconds, the Centaur destroyers retreated, such as still could move. Green spheres of deadly force gnawed slowly, grindingly at the shattered hulks of the others. Here and there a screen had leaked under the neutralizing action of the beams, and a disintegrating atomic bomb had gotten through, to consume the ship in glorious, washing green flame, pricked out with sparklets of deep, deep violet light that came, glowed for an instant, and vanished.

Angrily the light cruisers sailed forward to route the destroyers of the human fleets. Stricken, mortally wounded, they fled before the glowing, malevolent green spheres of super-saturated space that collapsed into another, impossible space, immovably anchoring the cruisers. Helplessly caught, they washed out great power beams, only to see the smallest cruisers, protected by Aarn's infinitely more efficient protective screen, glow, and live through it. Invisible, the vicious heat rays left them untouched. Titanic transpons short-circuited themselves into extinction. And —here and there—a destroyer glowed slowly red, and burst into flaming incandescence as the sheer heat energy destroyed it.

The Centaurs wasted no more time. Slowly, the great battleships lumbered up. There was no swift, darting movement now; they were too huge to turn swiftly, despite their drive system.

The destroyers retreated hastily as the two fleets of battleships, reinforced by the heavy cruisers, came into action. Circling wide, the destroyers attempted to reach the enemy light ships, now wavering, weaving, darting behind the battle line.

And Aarn was not near. No man knew where he had gone, nor why, nor when he would return. Spencer and Carlisle, helplessly Earthbound by orders from the Commanding Staff, since

the *Nova* was gone, watched the battle by telatoscope on Earth.

"They're not using their gamma bombs," Carlisle commented.

"They're afraid of it—they can't use it when they fight in formation."

Anto Rayl was with them—he had given up his place on the *Santo Magya* for that. He smiled slowly now. "That is all well. We will—presently."

Almost as he spoke, a faint flush filled the volume of space the battle occupied, the tinge of ionization in the faint traces of vapor released from blasted ships. Gamma—deadly, terrifically penetrative gamma rays, released from slow explosion atomic bombs. The battleships of the Centaurs hung grimly at their posts, as the Centaur light ships, and even heavy cruisers, backed away.

"The battleship armour is stiff enough to stop even that." Spencer paused. "I wonder what new stunt they have."

"Have they any?" asked Carlisle.

"They must have—or they would have returned at once. Ah—that fellow got one too many." A great Centaur battleship was suddenly struggling, whipping vainly to escape the great clutching green fields. They swarmed swiftly now, eating, clinging, spreading. Half a dozen small ships burst from the side of the greater, and scuttled swift as thought to near-by ships. One reached its destination unharmed. The others, moths in Titan's flames, vanished as though they had no protection whatever as the inconceivable transpons of struggling battleships slashed across them for a minute fraction of a second.

Spencer moved suddenly. He settled himself at a second telatoscope, and began setting its constants carefully. The whirling haze on its stage cleared. They were in the heart of a giant battleship—in the control room. Spencer depressed a control that automatically locked the scene on the ship, whatever it might do.

There were some dozen or more Centaurs working keenly, swiftly at their instruments. A steady buzz of low voices echoed, yet only a slight hum of sound came from the battling ship itself.

Almost quiet it was. Spencer could not understand their words, but he smiled faintly. "Our philologists are beginning to decipher their language, I understand—the records they got last time. I wonder what they are saying." But that was not why he had turned to this set. He smiled grimly as he caught a sudden scene in their engine room. A dozen Centaurs were struggling to fit in a new tube in the automatic balancing circuits. There were three circuits, parallel in type and automatically switched over as one failed. Carefully Spencer inspected the design of their tubes. He whistled softly. "They don't use such hot stuff—that's a nickel-chromium heater they're using there—They'd be better off if they used molybdenum."

"Maybe no got," shrugged Carlisle. "See if they've got anything new."

"How can I—I don't even know when I see old stuff. They make the apparatus differently. Even if it does the same thing, it may not resemble our stuff." But he was busily skipping from one piece of apparatus to another. Suddenly he started back from the screen. Something green and huge intruded suddenly on the side of the stage, and the scene distorted wildly, slipped aside, and seemed to be engulfed in the greenness. Abruptly, only a green mist hung sparkling before them.

Softly, Spencer whistled. "The super-saturated field stops even *this!*"

In an instant he sought another ship. Outside, they could see the greenness spreading over the surface. A brief glance showed orderly confusion within the craft as the Centaurs sought to escape. Then—all the tiny escape ships were swiftly expanding incandescent gas. Caught in vagrant transpons or ultras, they vanished.

Spencer was in the heart of a ship, and his eyes were very, very intent. A half-score of Centaurs were gathered anxiously about some piece of apparatus, peering, watching. Tubes, gigantic things ten feet long were warming up slowly. There was a tenseness in the very air. Tensely Spencer spoke. "It's—like a drive apparatus—the usual drive though is combined kinetic and

momentum drive and—I don't see—the momentum—it's a *projector* though!"

A sharp voice snapped. An engineer drove home a plunger. Titanic transpons flared, and the apparatus seemed to strain, even the telatoscope twisting slightly as the enormous tensions built up to a sudden climax. Then—an automatic plunger drove down—and the tension collapsed.

Simultaneously, Anto Rayl, watching the other screen, cried out in horror. The gigantic *Santo Magya* suddenly, instantly, exploded into ultra-microscopic dust, the incredible strength of her hull shattered, gone in the minutest fraction of a second.

"My ship—" gasped Anto Rayl softly.

"Great God!" Spencer exploded into action. In an instant he reached a telephone, and his insistant, authoritative demands and perhaps his name, got a telephone circuit through to the United Command. The highest officials were there, for one organizer of forces, one strategist was worth a thousand scout ships, or even a light cruiser. Spencer suddenly raved into the telephone:

"It's suicide to fight—they can't do a thing—they're helpless—it's kinetic energy without momentum. Kinetic without momentum—irresistable!"

Anto Rayl had the scene on the telatoscope. Presently, Spencer saw, headquarters had them on their own instrument, and he deserted the telephone. "That's insane—kinetic energy without momentum!" snapped a Venusian Commander. "Both involve mass and velocity."

There were several Magyans present. Now Martal Harnat took the Venusian's place, Martal Harnat, the United Commander. "Why do you say this is possible? It sounds wrong to me," he said.

Spencer snapped his words swiftly. "Mass—velocity *are* both involved—but momentum involves the first power—MV—and kinetic energy involves the second power—$\frac{1}{2}MV^2$. Momentum then is vectoral—kinetic energy isn't! Don't you see, the *system* gains energy, but not momentum. Then to maintain momentum

constant, and increase velocity square—increase kinetic energy—the system must *scatter!* The *parts* have more kinetic energy—but the *system* contains no greater momentum. That's the only way to satisfy the conditions—increased kinetic energy—no more momentum."

"What can we do? They've destroyed two more ships—"

"It's too swift—too deadly—let them have their way—we must concede them the Neptune base."

"But then what can we do? Why stop at Neptune? Why not march on to Earth itself—turn those rays on Earth?"

Spencer snorted. "They haven't power enough to disturb the planet in the slightest. They wouldn't even raise the dust. The energy *must* be distributed throughout the whole mass attacked, and the entire blasted fleet couldn't touch us."

The order went out. Swifter than light the fleet retreated from the impossible battle. In seconds they ringed Mars, the planet next nearest Neptune, the others being on the opposite side of the system.

"But where," asked Carlisle softly, as Spencer shut off the telatoscope scene at the moment it showed the man at Headquarters doing the same," is Aarn. Personally, I think I should find him a great comfort at the present moment."

"Uhmmm—so should I," said Spencer, still busy with the telatoscope. Triumphantly, unopposed, the Centaur fleet was sweeping down on Neptune. As Spencer had readily realized, they had no intention of attacking Earth at once. That simply wasn't possible with their present force. But they were settling on Neptune. Already a hexagon of battleships had been laid out on Parssal Plateau, and another in Harman Basin. Machines and Centaurs were already at work, establishing the base.

Spencer looked on with lambent, angry eyes. There wasn't a thing he could do about it. But he turned the telatoscope till it showed the strange piece of apparatus he had seen before. He looked at it critically for some time, then finally sighed slowly. "I could probably make one like it, even without Aarn's math, but I'd need some one of the mathematicians of the systems

to help me. Then we could duplicate it, but—"

"They are already," interrupted Anto Rayl. He was looking at another telatoscope, and watching several dozen men working carefully over a whole roomful of telatoscopes. "They've got a whole corps of engineers, metallurgists, draughtsmen and mathematicians on it already. And," he smiled beatifically, "the Centaurs are congratulating themselves on one more weapon Earth doesn't have."

"It won't do us any good when we do get it," said Spencer sourly, "because they have the defense, of course. Only we haven't. We will have before long, though," he added thoughtfully. "I think—the answer is fairly easy—fairly obvious—but how to get the math factors down—" he paused. "Damn Aarn," he said hopelessly. "I can't handle that dope. I suppose I'll have to turn it over to some other fellow—".

CHAPTER EIGHT

JUST FOUR DAYS LATER, THE first of the defense devices was installed in a battleship. There were fairly simple things that had to be done to install them, really, for the K.E. ray needed only to be combined with momentum waves to become a readily handled tractor beam.

As they had realized, the Centaurs stopped on Neptune, and during those four days they worked valiantly. In an incredibly short time, huge furnaces and machines, brought disassembled from the home planet, had been set up and were roaring in full blast. Already a giant transpon beam plant had established a great arching beam that stretched across the billions of miles to the sun for power needed in their works. This beam, it hardly need be said, was proof against shortcircuiting, as Aarn had done with the other.

So, fairly peacefully, under conditions of an enforced truce, the two races worked, preparing for the next stage. On Earth, defense works were rushed, and production forces were being shaken firmly into place by Magyan experts. On Magya, the great shipyards were turning out the destroyers freely, and the giant hulls of battleships rose slowly, but with a grim steadiness.

And in a vast cavern, deep beneath Magya's surface, a mile-long skeletal structure began to take form, a structure of wonderful, dazzling sapphire blue. The great I-beams, ten feet in cross-section, were being welded in place—welded at a temperature of some seventy thousand degrees Centigrade, and then heat-treated

—in place! For about every joint, a great shifting mist formed, to solidify suddenly into such inconceivably deadly radiation that no living creature could watch directly; only by specially designed television devices was sight possible. The heart of Anrel furnished the furnaces for this job, clean, non-corroding, non-alloying flames of a metallurgist's idealized dreams. Work proceeded peacefully.

And then—Magya started in sudden amazement. A fleet of twenty Centaur battleships appeared within five million miles of the planet!

Instantly, utter confusion reigned in the Command Headquarters. Plans had not been laid for this.

This was not, to say the least, the first time Magya had seen a hostile war fleet. Magyans didn't need a great deal of organized instructions to fight. They had old plans, plans devised for fighting Tefflans. For one thing, they had the planetary forts, and they had still two great fortified moons. In addition, the surface of the planet was positively freckled with the transpon arc stations which had been using great arcs to break down the nitric acid in the seas.

Perhaps the Centaurs didn't expect to find Magya so well prepared. At any rate, it was a bad mistake to come within five million miles of the planet. Ordinarily a transpon beam isn't effective as a weapon at more than 10,000 miles. The Magyans made up in vigor what their beams lacked in directive force. Two hundred and eighty-seven stations on the planet itself turned their beams in the general direction of the fleet. That released heat—just heat in general. Trillions of horsepower of heat flaring about the fleet. It didn't greatly bother the battleships at first, but within a few seconds it became perfectly unbearable for the small ships. They fled.

Into the bargain, the titanic transpon beams of the two moon-forts shot out. These were designed solely as weapons, and they were highly effective up to 200,000 miles. They were still about 1% efficient at five million, and even one percent of their five trillion horsepower beams was unbearable.

The Centaur fleet retreated instantly. They went to one hundred million miles, faster than light. There they hung for investigation.

The two moons got busy. Because they were forts, the Magyans had never let them become antiquated. They had Green Field apparatus on a scale such as no ship could carry. Green Fields of a diameter approximately equal to the length of a fifty-man scout. Unfortunately their velocity was somewhat lower than that of light—but they would carry a hundred million miles. They did. And when made in that size, aided by a few gravity bombs, they sought out victims. One of the twenty battleships was destroyed.

One by one, thirty-seven battleships crossed over from Earth's space, to aid Magya. Only four of them had the Defense mechanism. Two heavy cruisers had it. It was a quite inadequate fleet for attack, and now the Centaur fleet had very evident plans. They set out for the planet Starth. Starth, number 77 of Anrel's family of 87 major planets, was the world nearest Magya in this System of Vast Distances. It was only three and a half billion miles away.

Magya, and the human fleets, had the pleasure of standing helplessly by while the Centaurs established a base on Starth. Their first act was to start the transpon beam on its long, long journey to Anrel for power. It would be a long time before that reached Anrel, hundreds of billions of miles away. In the meantime they set to work with their stored power.

And at almost exactly the same time, they started the same work on Neptune. Ships, protected by their K.E. rays, started for the Planetoid belts. Anrel had one, as had Sol. But in the Solar System, it was handier, and they started pulling more, and heavier material. In Anrel's system it had to be transported by the faster-than-light drive, for distances there were too vast for normal tractor towing.

It worked out the same. In a day they had half a dozen good-sized asteroids circling their base-planets in orbits. In two, the asteroids were being fused to make a new, larger moon. They

were being welded into a great, hollow fort, with half-mile thick metal walls. The cruisers did that, while the battleships, with their K.E. ray defense, hauled more material.

And the human fleets hung by, utterly helpless to come within a million miles, while the impregnable defenses were made up. The K.E. defense was being rushed—but the Centaurs knew that. They rushed too. They concentrated on moving asteroids. They moved dozens each day. And since an asteroid is, in general, nothing but a solid mass of very high-grade armor-plate steel, a fine, nickel-steel alloy, they were building up a very nice little system of forts.

By the telatoscope, Spencer watched the Centaurs fitting the giant things with great machines that were coming across from the mysterious home planet of the Centaurs in great freight transports. The ships simply—became. They did not *come*, they *appeared*.

"They're good engineers," he said sourly. "Those blasted things will be just about *but not quite impregnable!*" Spencer had gotten the answer. His bitter expression faded into one of savage satisfaction. "There's only one thing that can smash these invaders!"

Anto Rayl got it also. "Ma-kanee," he said softly. Ma-kanee was the moon the Magyan's had thrown down on Teff-el, their ancient enemy planet. The forts were invulnerable because they were too big for any ship to attack. Well—there were things bigger than they were! "What moons have you we could use—"

"We have a beautiful little moon right here, sir," said Spencer blissfully. "It revolves about the planet Mars—a small planet, which means we can pull it free of the planet quickly. It's about twenty miles in diameter, and very, very rugged."

"And we still have most of the driving apparatus we used when we moved Ma-kanee against Teff-el. We can install it in a few weeks—"

"Let us then be up and doing," Spencer rose as he spoke. "Let's go see the Command Headquarters. They ought to be interested—"

"Could the Centaurs prevent us reaching the moon you mention in any way? By their K.E. rays for instance?"

"Not a chance—Mars is armed to the teeth—God of War in fact, I guess. And the moons have been loaded with high-power junk already. It'll be simple, really—"

"It will take three months at the least, just to set up the apparatus."

Spencer looked at the telatoscope stage. Neptune loomed huge, a dozen little moonlets swinging around her; and around each moonlet swung several ships, working at her, spotted with tiny glowing lights. "They'll have a fine collection of things, before long," he said sourly.

The High Command took the suggestion to heart joyfully. In a day the gigantic apparatus that had been salvaged from the seven hundred mile moon, Ma-kanee, was being transhipped to Earth for installation in Phobos.

And with steady, persistent work, the ring of planetoid moons about Neptune grew. It was going to take a tremendous amount of work to dislodge the Centaurs. And still their battleships equipped with K.E. rays worked unhindered, for the humans had not finished the great task of re-equipping all their ships for a final contest. The ships could not be docked fast enough, since all, or nearly all the great ways were engaged in building operations.

And then—Aarn returned. From nowhere, his ship appeared, a hundred million miles off Earth, and signalled for landing. Recognized, the *Nova* dove down at terrific speed, and landed again, near the Spencer Research Laboratories. Spencer was on the field to greet him, and with Carlisle and Anto Rayl stepped into the *Nova* as soon as Aarn threw open the lock.

It was a few days more than two weeks since Aarn had left. But they stopped in amazement as they looked at the Jovian. He looked positively thin, and haggard beyond belief. He was worn out, utterly exhausted. His eyes seemed wild, strange, in their deep-set sockets. Wearily he waved to them.

" 'Lo Spence. I see the Centaurs are back. How'd they get in this time?"

"Good God, Aarn, what have you been doing? You look as though some one tried to draw you down to a number six wire! The Centaurs had a new weapon—explosive beam none of our apparatus would stop. Blew up four battleships."

Aarn smiled wearily. "They did uh—kinetic energy beam I suppose. They would. We were horribly slow thinking of it. I thought of it—" his face changed, became even more drawn if possible, and his voice became somewhat hoarse as he mentioned it, waving his hand vaguely,"—out there. You think of things—there. You have the defense, I suppose?"

"Some of the ships have now. They're equipping them for a show-down fight. The Centaurs are making moon-forts out of planetoids. Planetary Orbital Forts. We want to bottle up their ships at least, as soon as possible—but we can't handle those big battleships very rapidly."

Aarn laughed hollowly. "Got say ten ships equipped? You have—good! Tell the Command to send 'em along. I'll bottle up their ships, if ten battleships can back me up. That's one weapon they never will get, by all the Cycles of Space! I—I nearly went mad, getting it—and I had the telatoscope.

"Get at it, will you, Anto? I'm—tired. Three—three months, where I was—my time. I didn't sleep. You don't seem to have to out there. But I'm about—out, now. And I have to work the damned thing. Let me rest a bit. I need some eats, too. Get Martin, will you, Spence?"

Aarn almost collapsed in his chair, as Anto Rayl left to get in touch with the Command Headquarters. Spencer went to get Martin, their butler-chef-valet, a deep wonderment in his eyes. Never in all the years he had known him had Spencer seen Aarn looking even slightly tired. Aarn was inhuman in his strength, inhuman in his speed of mind and eye and hand—and inhuman in his endurance. Now—he was a worn-out shell!

He was back in ten minutes, Anto returning almost simultaneously. It was to Anto Rayl Aarn spoke first. "What say?"

"They took your word, Aarn. You knew they would. Ten ships, and twenty-seven equipped cruisers and two hundred destroyers are going as soon as men can be gathered—an hour or so."

"Good. I'm going to take a bath." Aarn rose, and went toward his room, his step unsteady, jerking slightly from fatigue. Spencer went back to the power room to see if he could see Aarn's new apparatus.

He saw it. It sat directly in the center of the room, engulfing the material engine that loomed huge before it. Spencer took one look at it, and he turned sick to his very soul. It was made up of angles and planes and surfaces. But the angles weren't as angles should be. The acute angles were obtuse, and the obtuse angles were—geometers had never named angles like that. And the planes. They were planes, but they twisted. They didn't twist up, they didn't twist down—but they twisted, twisted in a violently indescribable way.

Spencer went back to the control room and sat down. Some faint, dim understanding of Aarn's mental torture came to him. Aarn said he'd been gone three months. That suggested another space. That—thing in the power room suggested something beyond conception. Spencer couldn't remember it at all, because he couldn't mentally picture the thing. The human mind wasn't naturally built that way. He wondered vaguely how Aarn had conceived it; wondered incredulously how he had built it.

Aarn returned in three quarters of an hour. He'd eaten, and he'd had a bath, but he was still exhausted beyond belief. Only driving will kept him moving.

"Those ships ready?" he asked Anto Rayl as he came in.

"They rushed. They're ready to leave. They want to know what you have, to copy. Make plans of."

Aarn burst out into a roar of hollow laughter. "Copy. Plans. Tell them to go down into Hell, and watch the curves of Satan's horns. When they make copies of that, then maybe they can copy what I have. Tell them to take a picture of it.

Tell them that I don't know the plans of it—now. Tell them—Oh—go back and look at it."

Aarn settled at the controls. Wonderingly, Anto Rayl went back in the control room. Thirty seconds later he came back. His normally tanned face was pale, and his eyes were peculiar.

Silently he picked up the telephone aboard the ship, and a moment later he was talking to the Secretary of the High Command.

"Anto Rayl. I beg to report I have seen Aarn's machine. It cannot be copied. Plans? No. There are no plans. It is beyond plans. Describe it? Hwhah—I'm human—it isn't. It can't be copied. Now—now that I'm not looking at it I don't think it exists. Stop repeating that 'we need plans'. Get this: whatever it is, whatever it does, it does it, and nothing like it will ever be made on Earth. Turn your telatoscope on it."

Aarn grinned maliciously. "The telatoscope—he'll see it, all right, and he'll tell them it's blue, like durium, and scarlet—that's ultra-sulfur, Carlisle—and grey-green, and that's ultra-magnesium carbide. But he won't tell them what it is."

The *Nova* rose. She swept up from Earth, and behind her came the fleet, judiciously spaced. Aarn was working at the telatoscope, somehow drawing from some deep well of energy much of his customary speed. Then the *Nova* darted out toward the planetoids. The fleet followed—piloted by Jovians such as Aarn.

There were three battleships of the Centaurs there, and four great transports. They were hauling several billions of tons of planetoid. The battleships swung abruptly as the *Nova* appeared. They weren't agile here, and neither was the human fleet. It hung back now, unable to maneuver through the asteroids as could the relatively tiny *Nova.*

The Centaur ships turned, angrily it seemed, and directed their combined rays at this presumptuous heavy cruiser. The K.E. rays. Then they danced away as Spencer sent out a stream of the deadly green fields.

Aarn laughed, very softly. "Don't do that, Spence. It's just

a waste of energy. They won't hurt us with their beams—" They didn't. The beams washed off of the *Nova's* defense. Aarn explained jerkily. "Our defense is founded on durium—not the one you must use, come to think of it. You couldn't think of this one—here. Only—out there, where you can understand all about durium. Why it has such peculiar electric and magnetic properties. Gravitic, too, for that matter.

"Anyway—our weapon's the Cosmical Constant."

Aarn used it then. From somewhere in the ship, everywhere in the ship, came a strange vibration. It wasn't sound, it wasn't light, it wasn't annoying. It was vastly stimulating—but it wasn't any vibration such as man had ever known. Briefly it grew in intensity—then it seemed to burst, and from the nose of the *Nova,* the Cosmical Constant bomb drifted out. Actually, it traveled at a speed immeasurably faster than light. But it created a strange effect on human eyes. It seemed black, blacker than space, the ultimate in blackness because it devoured all light. It touched the nose of a Centaur battleship, and that turned black. It passed several layers of defensive screening on the way, absorbing them, but when it touched the ship, it stopped. Two hundred feet of the nose vanished in the blackness, and gradually turned grey once more, the dull, powdery grey spreading further for a moment afterward. And the grey powder that had been ten-foot steel armor was expanding with terrific velocity. In seconds it hit the *Nova's* screens, and the ship jarred slightly to it. Another bomb reached out. There was no flash, no sound. Only the momentary blackness, and the spreading grey dust—then there were no Centaur ships as they raced for their base.

Aarn followed them, faster than light, as they had gone. He caught up as they stopped, off Neptune finished the destruction of one battleship before it could reach safety. He sent three of the bombs scudding toward the planet; then a transpon licked out at him, and the bombs were stopped, somehow, in drinking up the transpon beam. For several seconds ships appeared suddenly near Neptune from all over the Solar System. The Centaurs were being called in. For the work had been done. The Centaurs

knew now that the human fleets possessed a weapon they could not fight.

The Centaur fleets were bottled up.

Grandly, the ten great battleships swept up to ring Neptune. Cruisers and destroyers deployed about the planet. The *Nova* hung off Neptune, and the Centaur fleet could not move, save within the protection of the titanic planetary defenses.

Half an hour later, the Centaur fleet in Magya's space was bottled up.

Aarn had been silent as he did his work. Now he asked a question. "Have they found the home planet of the Centaurs?"

"No," replied Spencer. "They can't. They can't follow the ships, because they go out of this space, into some one of the hundreds of possible spaces in the inter-space, and we can't follow. Then they must come back to their own planet, in this space directly."

Aarn blinked weary, burning eyes. "We'll have to follow them. Until we can attack them, they'll never leave us alone.

"I'll have to sleep soon. But you saw the weapon. It's the Cosmical Constant in action. It's something new—it's not four dimensional—it's a fifth-dimensional twist, just a slight fifth-dimensional twist in space. It isn't effective ordinarily, because it's slight. It becomes operative only at enormous distances, because there the effects of the fourth dimensional curvature of gravity are almost nil.

"But those bombs are really that fifth-dimensional twist isolated, and condensed. It was very hard to work out—even there. You see—the best of our ordinary math is fourth dimensional, really, and our best geometry. I had to invent new math, and new geometry because—fourth dimensional stuff won't handle it. It—seems to be fifth dimensional. Perhaps—it may even give us some clue to—the interspace.

"The bombs are a concentrated form of that special twist; they represent the isolated Cosmical Constant. Pure repulsion. No atom can resist that. It does two things, really; it makes every atom *repel* every other atom. It doesn't require an enormous

amount of energy really—it—it seems to be—" Aarn simply fell silent.

"What?" demanded Spencer.

"Beyond the law of conservation of energy," replied Aarn. "Or perhaps obedient to some higher Law of Conservation. I tried it a good bit, out there by those Dark Stars. It—made a rather weird laboratory. Ask Canning about his brief experience. The laws of optics don't hold, and the laws of geometry are different. You see, when I first grasped the idea of this thing, I had a number of difficulties—rather inconceivable." He looked at his friends peculiarly before he went on. "As a matter of fact—I can't explain, or understand the thing now. I couldn't make it now. My mind can't really conceive it. I looked at it just a bit ago. You—can if you want to. It's in Number One Power room. Look at it—I'll tell you where and how I made it then."

Silently, Carlisle went back. There was the something—on the floor of the power room. It bulked thick and squat. And it was—wrong. There were strange protruberances that curved in, and yet stuck out, and there were some plates that twisted. They didn't twist up, or down, or left or right—but somehow—they twisted.

He came back to the control room, understanding in some measure the unbearable mental agony Aarn must have undergone in the making of that, for he too was a mathematician. It was not a thing for human eyes to see—certainly nothing for human mind to conceive.

"Rather peculiar—isn't it? Now, I don't know how I made it. I followed some calculations I was—inspired to make when I constructed it. It's made out of durium, and resistium and some ultra-sulfur. I made that, by the way, Carlisle, because I had to, and because it was possible where I was. It's stable now, because of some of the fields I keep in that thing. I can stop radioactivity, too. It's a perfect insulator. I needed the durium, because the electrical properties are so peculiar—" Aarn stopped, frowning deeply. Spencer looked at him with narrowed, intensely worried eyes. Aarn was incredibly haggard, incredibly tired.

Suddenly Aarn looked up, bewilderment in his deep-set eyes. "I knew why they were—back there. I can't remember why now. I knew all about durium, and why it did that. And I calculated on it. Then I tried to make the thing, but it wouldn't be the way I made it, because the apparatus was always wrong, though I thought I set it right. Finally I had to use the telatoscope, and though the instruments read one thing, the telatoscope image of them was an entirely different thing. I knew why that was, too—back there, near S.F-R-237. That's a dead star—it's half a million miles in diameter though—surface gravity of something like 1.7 megagravs—that's a unit I invented—million earth-gravities.

"Anyway—I cast those plates, and they looked right, there.

"I found a tool metal that would cut them too—you saw they were machined, Spence. I machined them with an ultra-carbide. It took twenty-million degrees centigrade to act as my electric furnace for that carbide's formation, too. But it was hard. It cut durium like cheese. I had to use a force-field to hold it, and drive it, because I couldn't make a metal machine that would stand the strain of cutting even when the durium was annealed, and I had to machine some parts when they were hard."

Spencer interrupted. "Did you sleep, Aarn?"

"No—you don't have to, there. It seems to stimulate you somehow. Time seemed distorted too—it showed three and a half months, on my ship's chronometers. But I watched the telatoscope image of the lab chronometer here on Earth this time. I tried watching the second hand—but it moved so slowly, I grew tired of it.

"Anyhow, I cut the things, and watched the telatoscope image. In the telatoscope, the plates and things looked wrong—the way they do here. But I knew why they did, then, and knew they were right. And when they were made, I assembled them there. Then I tried the thing. It worked, and I gathered all the pieces, and always, one tenth of one percent of the mass was lost, and it was not released as energy, even calculating the energy of disruption. It was—gone.

"But I conceived the idea of the K.E. ray there, too, and—

something—something important, I've forgotten it now. Something you can't think of in this kind of space, only there, where space isn't the same, and angles are different, and different geometry and laws apply."

He looked up at Spencer for a moment. "For a little, there, I knew the whole answer to the energy of the suns. I can only remember this much, now—it's inexhaustible. It will go on forever. It always has, you see. There's something cyclic about it—the expanding and contracting, that is. There are different Laws of Conservation in those higher spaces—the Interspace for instance—and they nullify all our predictions of a dead universe. The 'dead suns' are just latent—storing energy now, till the time of the next cycle. When the expansion reaches the limiting value given—by—given by—

"I've forgotten. I had it worked out on the machines, but the plungers slipped somehow when I left those fields.

"Anyway, the expansion is succeeded by a tremendous contraction, and starts again. Like the Cepheid variables, because of course, they're really much the same—they too are limited by the expression I mentioned, but their enormous density, and the effects of the Cosmical Constant in their hearts makes the action with them take place every few days instead of every few hundred quintillion of years.

"But there's something very important there—something about the telatoscope, that makes it possible to project images—"

"That can't be it, Aarn," said Spencer softly, "because you can now."

"Oh, yes, but not far—only a few miles at the utmost, and then they're ghostly. And—that wasn't it, I guess. I knew—I knew out there. It was something immensely important. Something—" His infinitely weary voice seemed to die away, and for an instant his whole body slumped, and Spencer started toward him.

Then—abruptly, Spencer started back in horror, rooted in amazement. Before his eyes, Aarn's powerful, chunky body twisted and writhed, the eyes opened, suddenly bright and alert,

but incredibly, horribly different. There was a harsh glare in them, a terrible commanding power, and in the whole body there was wrongness; it was misshapen, and Spencer got half-glimpses of the bony skeletal structure through flesh and clothing, and gasped.

Aarn spoke, and as his jaw moved, the bones in it seemed to writhe in distorted angles. His voice did not seem to stir the air, but penetrate directly to their minds as he spoke. He laughed, softly, and contentedly. "Ahhhh—yes—so easy. I must go back there. And Carlisle, you must go with me to help with the math, and you Spence, to make the apparatus designs. It must be very heavy stuff, and you can handle the engineering better than I. But it is clear now, what I want. I can see. It must project images, and *cancel* waves, the infinite, all-reaching atom waves. You see—you can see—or can you? The waves are everywhere, so of course we must win. It is very simple. Even with the little short-range apparatus like this portable one, I can—"

Aarn reached for the small apparatus on the side rack, his impossibly, obscenely twisted hands grasping it, lifting it. "I turn it through forty-seven degrees—about like this—then the circuits must be— be—" Abruptly he sank into his seat, and again the wave of change passed over him, and in reverse. He was normal once more. But—he had twisted the little set through forty-seven degrees. His eyes opened once more, dull and infinitely weary, and he released the thing he held, grimacing in horror. He stared at it for an instant, and suddenly he was sleeping, sleeping humanly and deeply.

For a long instant there was silence, then Spencer spoke.

"Turn off the gravity, Carlisle, and put him in his bunk. I'll—move—*that*." It wasn't a telatoscope any more. He threw a dust-cover over the impossible device, and lifted it. His fingers crawled as they grasped the projections that were hollowed, concave pits, sharply angular, yet flat.

CHAPTER NINE

AARN LOOKED AT THE THING FOR a few moments, then turned away. "I did that? I suppose so. I don't know how, I'm sure. I'll have to go back there though, and I guess you'll have to accompany me. I can't remember anything now. I couldn't repair that apparatus I built if it failed for an instant.

"But—now that I've slept and eaten and slept again, I feel human. Let's get down to business. Have they located the home world of these Centaurs?"

"No," replied Spencer, "they haven't. There are so many many suns, and none they've found yet has any inhabited planets, though they've found two more planetary systems—and even located our friends the Tornans again. But no Centaurs. Is there any real chance of it?"

"Probably not. There are a tremendous number of stars—too tremendous. All we can do is follow them home."

"No we can't. We tried that. It doesn't work. We can't get really near one of their ships, because if it's a small ship, they destroy it before crossing, and if it's a large ship, they don't make the crossing. They duck out of this space, into some other fifth dimensional space, and return to this space at their own sun. It's really a quicker, easier method than any other, and impossible to follow."

"Hmmm—" said Aarn grimly. "*It was* impossible to follow. We'll have to follow just the same. I've forgotten a lot of the stuff I learned Out There, but not everything. And I know that

out there I could see quite clearly the interrelationship of the four dimensional space with the fifth dimensional interspace. And I assure you that since my little sweetheart back there with the crosseyed angles operates in the fifth dimension, whatever they try to do, it won't have to work on four dimensions trying to follow through five. It will stay in the fifth, and be able to reach the whole line through into whatever Universe they enter. I'll be able—no I won't! I'll have to follow their line through with a Cosmical Constant bomb, and that will destroy their ship the instant it rematerializes in the other space. The CC bombs will have no effect on a transitory ship, but they have to stop in the other space to jump off again and land back in this one, and in that instant, the CC bomb will catch up with them."

"That's all right. We don't mind if you ruin a couple more Centaur ships. You'll just have to follow one over there to the other space, and another one, at a later time, back to this space."

"Uhm—I guess I can do that. But they may make a habit of landing in that second space, anywhere in it, which would mean an entire infinity for me to search before finding their ship jumping from it, back to this."

"Wait till they send two through at the same time. Won't that do?" asked Carlisle.

"Do they ever do that, though?" asked Spencer.

Anto Rayl spoke for the first time. "Yes. I've seen them. Their transports are frequently accompanied by battleships, when they're bringing over a particularly important load."

"We'll wait," said Aarn decisively. "I want to see what I can make of my notes, anyway."

For five days they hung off Neptune, waiting. The forces of the Centaurs were consolidating. Their ring of planetoid forts was being equipped beautifully and thoroughly. More transpon beams began to stab down toward the sun, securing power directly, instead of tapping the main beam from Neptune stations. One at a time, a number of transports made the crossing to and from far-distant Malc, landing with important cargoes of apparatus, and still Aarn waited.

Together, the three went over Aarn's notes. Most of them had been made with the telatoscope on films, and were legible, but some had been penciled in books, and the weirdly angular hetrogeny was utterly impossible to decipher, merely causing head-splitting eye-strain. The curves of the letters disappeared mysteriously *into* the paper, to reappear abruptly on the opposite side of the sheet. Notes made on the back-cover of one book they found, by steaming off the sheet, were continued on the side of the paper which was glued to the binding. They gave these up in despair, knowing that only Out There would they be legible.

The fifth day, a transport rose from Neptune, and beside it came a great silver-grey battleship's hull. Aarn settled himself abruptly into the control seat. The pair of giant ships rose till they were a quarter of a million miles from the planet, just inside the protecting wall of destruction the planetoid forts could fling out. Then—they began abruptly to shrink into the infinite distance or infinite smallness characteristic of inter-space motion.

Aarn moved slightly in his seat. The ships had almost vanished when a CC bomb moved out with its weirdly deceptive speed. It swerved, and twisted in its course, circling on some invisible shortest path. Then abruptly it attached itself to the vanishing battleship. Simultaneously, the *Nova* jerked in sympathy, a dozen dials snapped into new positions, and relays thudded automatically. The *Nova* changed, and Neptune, Earth, the Solar System swam mistily and vanished.

Abruptly, they had made the crossing. Light, vast and azure blue, flooded in through the ports. Aarn stiffened, his nerves taut, as the *Nova* spun on her axis. Then he gasped. Close by—less than a hundred miles off, was the Centaur battleship. It was vanishing, vanishing as the CC bomb ate into and through it. The transport, too, was vanishing. Somehow, in crossing the interspace the CC bomb had doubled itself! And far, far distant, shone three titanic blue suns. Only three were visible in all the sweep of space. Other than these, there was neither sun, nor planet, nor gaseous nebula. All the space seemed made of clear,

infinitely transparent blue light. They had entered the Blue Universe.

"Whoa—hey, what gives? BLUE! Light in empty space! It seems to extend to infinity," gasped Spencer.

"Different laws," said Aarn softly. "Different characteristics of space. Or—infinite age. The suns of this space may have dissipated all their energies in light, blue light, till they are dead, and only the light remains to wander forever through space."

"But the three suns there—three suns close together."

As he spoke, they appeared on the telatoscope stage. Aarn started slightly as he looked at their images, inch-round fiery blue balls. "They're immense," said Aarn, "each is as large as Anrel itself." One of them centered, and expanded swiftly.

Then—they saw the first of the Fire Planets. It was white, white with the glowing heat it received from the immense, blue-hot sun so near it. Swiftly Aarn shifted the scene of the telatoscope. One after another, the nine Fire Planets revolving about the three giant Blue Suns appeared. Carlisle was busy with the gravitometric and momentumetric devices. Finally he spoke.

"Aarn—this thing isn't real. It can't be real. It's too perfect to be real. It's—it's a problem in mathematics, worked out and set up as an illustration, it's like those wire cages they make to show students a hyperboloid. Aarn—those three stars are within one percent of exactly the same mass. They revolve about each other in such a way that each is exactly at one apex of an equilateral triangle. Each of those three planets that revolves about each of the three stars, revolves in exactly the same orbit, each chasing the other like the wooden horses on a merry-go-round. The three apices of an equilateral triangle—that's one of the specific solutions to the Problem of Three Bodies. One of the simplest and earliest, the classic solution. Now in a multiple star system, you can have planets, satellites, stable only under certain conditions. There are 'forbidden' orbits just like the 'forbidden' electron orbits in the Bohr atom. They can revolve about *one* of the stars of the system at such a short distance they are

virtually unaffected by the others. Or they can revolve about the common center of gravity of the system at such a distance the motions of the stars of the system leave them virtually unaffected. But they can't revolve between those limits. Now—Aarn, focus the telatoscope at about 356-27-453."

Aarn changed his settings. A world swam into view. A great round world, off to one side of the stage. It was perfectly round, a perfect sphere, and it was absolutely featureless, a blue, level plain. Aarn started. "I can't see the surface," he said softly. "That's not the surface—that's the surface of a screen that's *impenetrable to the telatoscope!*" As he spoke, the image drove nearer, expanding swiftly, then suddenly shied away, and the featureless surface sparkled with tiny sapphire gems that came and glowed and vanished. The telatoscope image winked and dodged, and suddenly was far away. Aarn changed his settings. His face was drawn and tense with tremendous interest. "They can stop that telatoscope. A star can't do that. I can't do that myself."

"Yes you can, Aarn," said Spencer. "The Green Fields will stop them. And—can you analyse that deflecting screen?"

"No. Not now. I can only say it extends up from fifth dimensional characteristics. CC bombs would disrupt it, I think, but I don't care to annoy anyone who can make that screen. It's perfectly transparent to normal light and heat. I think—"

Aarn's thoughts were lost. Carlisle snapped a word of warning, Anto Rayl suddenly moved in his seat, and depressed a plunger. A titanic transpon beam leaped out at the thing that had appeared. A half mile in diameter, it was blue, blue and clear and limpid, save in the center, where a great ruby blotch of light sprawled and writhed. It was made up of an innumerable, unguessable host of tiny ruby fibers that threaded out in winking, glowing light through the sapphire radiance of the greater shell of light. The transpon struck it, and sped through it, unhindered, inactive. Almost simultaneously, Spencer released his entire collection of armaments. All were ineffectual.

An invisibly fine ruby filament extended suddenly toward

the *Nova,* expanded to a cable a foot thick, and as it seemed about to touch the ship shied, bent double, and seemed to grow deep violet. Hastily it was jerked back.

"Momentum—" said Aarn. A terrific tractor beam drove out at the Thing, and all the fine ruby filaments turned violet, and quivered. The thing danced and jumped, its sapphire substance writhed, expanded and contracted, and slowly the violet color crept in toward the great ruby ganglion at the center. Suddenly cold white flame began to pour from it, washing out toward the momentum wave beam, toward the ship. The white flame touched the ship, and instantly, the outer hull blazed with incredible incandescence, heated to a temperature beyond comprehension, and the stubborn, almost infusible resistium exploded in little slow puffs of vapor.

"Great Gods!" exclaimed Anto Rayl, "what *is* that thing—boiling resistium!"

"Force—force, living and malignant," snapped Aarn.

But he was working. The green field bombs moved out gently, veered toward the white flame, and drank it in. The incredible blow-torch suddenly faded out. Green fields sank into it, and vanished in tenths of a second. Slowly they ate back toward the Thing. Finally, one reached it, reached it—and rebounded! It headed toward the *Nova* itself! Never under good control, the thing was a savage menace, and Aarn hurled out a dozen attractive centers to draw it in, instantly cutting off his projection of Green Fields, and snapping the *Nova* out of the region of danger.

Faster than light, the *Nova* outraced the Green Fields. But the Thing followed!

And as suddenly as the first had appeared—a score more came into being beside the *Nova.* Deep red filaments reached out, joined among them, and in a thousandth of a second, the *Nova* was in a great far-flung net of brilliantly glowing, foot-thick ruby cables. Abruptly, the *Nova* stopped her flight. The super-space drive failed! Aarn, his face white, snapped it off, and threw on the maximum power of the momentum waves. The great cables

about the ship turned a red-violet, and squirmed and writhed, but they held! They glowed more intensely; more of the Things joined their comrades—more, till the Blue Universe was blotted out by their red-glowing cables. The *Nova* moved again, but not under her own power! Faster than light, the ship began to sweep toward the triple suns.

"It seems they want us," said Carlisle. "What about the Cosmical Constant bombs?"

"I'm afraid of them. They'll hurl us out of this space, certainly, if I use them so close by—" replied Aarn. But he set up the controls. "I wonder what they want of us—what they'll do. They act almost as though they were intelligent forces!"

"Invulnerable forces," suggested Spencer tensely.

"I don't think so. I think they have the same general pattern as the telatoscope waves. They evidently live on these Fire Planets themselves! If that's where they're taking us—"

"Then that's the reason for that telatoscope proof screen on that world we tried to look at! It's proof against these Things!"

"Then there's another race there. I wonder what—" began Aarn. And he stopped in amazement. A great ruby ganglion had turned violently purple, writhed and shriveled, another—another. Abruptly the things were fleeing, shrinking. And far, far across space, a dim greenish ray reached out, a dim, soft thing, a thing of enormous scope, hundreds of miles in diameter. All the sapphire and ruby things were struggling, shrinking in it. And the *Nova* hummed and chattered and whispered with faint hag-mumblings. And the opposite end of the greenish ray vanished at the Blue World they had discovered, vanished behind the thin, impenetrable blue screen.

Softly Anto Rayl whistled. The ruby and sapphire things, less than a score now, were fleeing and the murmurs left the *Nova,* and swept away with the greenish radiance.

Aarn moved. He depressed a plunger, and mighty transpons back of them roared in protest. Softly, with the faint *pouf* of bursting soap bubbles, the black CC bombs drifted out of the ship, across the Blue Universe, and touched the last of the Things.

Like an extinguished candle, it puffed out, its radiance gone, instantly. Simultaneously the green radiance shifted, swung, and concentrated on the CC bomb, drawn in by it. The struggling, nauseous violet of the Things changed, became deep red again as they were relieved of the strain. Then they were suddenly sweeping back, the red filaments waving and darting, struggling. But they fell to the CC bombs, and vanished instantly.

"They're four dimensional structures — short circuited through the fifth," said Aarn.

Abruptly, something seized the *Nova.* Something tremendous in its might, and the ship swam mistily for a moment in the Blue Universe, while the giant triple suns grew immense, and burst into blackness. Utter, infinite black settled down, with only the sprinkling of far, far distant stars.

Aarn gulped. "They—they didn't want us there," he said respectfully. "I wonder, Carlisle—if my ironical comment wasn't true! If your wild speculation wasn't cold *fact!* If perhaps that isn't a *designed* Universe! Whoever they are, they on that shielded planet, they didn't want us there, and they didn't want to harm us. So—they threw us out!"

"Where are we?" asked Anto Rayl.

"In some other universe. Which one? I don't know. Not ours. Not yours. But we can find ours readily enough, since we know the settings." Again the *Nova* swam mistily, the distant suns expanded suddenly, then vanished for an instant.

Sol shown enormous, bright. Venus swung some ten million miles off to one side, familiar Earth shown distant, on the far side of the sun.

"Someday," said Aarn softly, "someday when this is all settled, and when I have the *Sapphire*—that's what the new ship will be called—I'm going back there to the Blue Universe."

CHAPTER TEN

A BLUE CYLINDRICAL JEWEL, sapphire blue in Anrel's white light, it loomed enormous, even on the surface of the huge satellite. It was nearly complete, as nearly complete as the human mind could make it, here and now. The *Nova* lay tiny and silvery beside the immense bulk of the newly built *Sapphire.*

The dedication speeches were nearly complete, the Terrestrial guests making the longest and driest. The Magyan engineers and physicists who had had the mighty task of rushing the ship to completion had had little to say. The Magyan Council which had done most to see to it, had less to say. The Terrestrials who had had almost nothing to do with it, seeing it in most cases for the first time, had a very great deal to say.

Aarn, Carlisle, Spencer and Anto Rayl had spoken a few words publicly and were speaking privately while the President of the United States of Earth spoke long and loudly.

"We'll leave in about an hour, won't we?" asked Aarn.

Anto Rayl looked sourly at the President of the United States of Earth. "I suppose you know him better than I do. So far as the Magyan part is concerned, you can leave now. But where are we going when we go?"

"Trial trip. The *Nova* goes as the emergency boat. She's going to be connected into the main leads of the big ship as a reserve power generator, too. Though if we ever needed the *Nova's* aid, she wouldn't count anyway, with the power that thing's got. But—the trial trip isn't much more than a formality. Then—the unpleasant task of going to the dead star. It's even

heavier than the one I visited last time. The astronomers on Earth, searching with their telatoscopes, found it. We'll be there about two or three weeks Earth and Magya time."

"What all have you to do?"

"I don't know," said Aarn uncomfortably. "I'm still thinking of that horrible thing I turned the telatoscope into. There is something I have to do out there, beside the obvious task of making up the Cosmical Constant apparatus. Then, whatever it was I was trying to do when I twisted that telatoscope, I'll have to figure it out, and make it, I suppose. Perhaps, when I've studied out there long enough, this time with companions, I'll have some idea of it all when I come back."

Anto Rayl nodded. He looked up at the tremendous hull. Four thousand three hundred and eighty feet in length. Two thousand three hundred and ten feet it rose straight through the mid-section diameter. Only the enormous strength of durium made a structure of such size possible; no other material could have sustained the concentrated mass it carried. There was empty space aboard her, but not much, in consideration of her size. The *Sapphire* was fairly completely filled, but in her heart a vast space, larger than a four-story office building, remained vacant, ready for the apparatus Aarn must install in the weirdly intense gravitational fields of the super-stars.

Two days passed before the ship finally left. Aarn Munro, Spencer, Carlisle and at Aarn's insistence, Anto Rayl, were the passengers and crew. None others were needed for all the ship's colossal size. Automatic controls watched over her, automatic controls that were telatoscopes, unaffected by the fields she was soon to enter. She could not have fought with full efficiency, so undermanned, but this was not a fighting trip.

The *Sapphire* rose, magnificently blue, majestically immense. She vanished as she cut across space from Magya, to Earth's space, but not to Earth. To a new star, a star small as Mars in diameter, and fifteen times as massive as the Sun!

At twenty million miles, Aarn halted. The fields were beginning to become intense. This close the star glittered white, bril-

liantly white and hot. Hot as the sun from Earth, despite its minute size. Then the *Sapphire* moved closer. Slowly, very slowly, while the men watched the angles and curves of her cabins writhe and twist out of shape, and out of space, actually. At half a million miles they halted. Spencer answered Aarn's unspoken question.

"I, for one, think this—is about enough—for this dose. It's —rather uncomfortable." He looked about at a cabin weirdly distorted, weirdly unfamiliar, yet familiar. "I wonder if your notes will be any more readable here?"

Aarn locked the controls and rose. He was smiling gently, and the strange light they had seen once before was returning to his eyes. "This isn't bad. I'm beginning to think again," he said softly. "The notes will be somewhat more readable now, I believe. I think I will be quite able to read them."

He took out the note books, and spread them on the mathematics bench, while the others clustered around. The curves of the letters were strange, misshapen. The letters were broken, impossibly diving through the pages, through to other pages, and returning in one completed loop. As Spencer looked, his eyes ached, and his head felt swollen, ready to explode. He looked away. "Put them away for a while, Aarn," he gasped.

Aarn laughed softly, delightedly. "No, Spence, no. I can understand them now. Suddenly, I saw them. I can read them easily now. Look—follow this pencil point." He grasped his pencil, and it followed the line of a letter, slowly. Then suddenly it dived into, and through the paper—yet on the surface of that page! And as it did—there was a click in Spencer's brain, a share, revealing snap, and abruptly the pages were plain, and understandable. He gasped softly.

Carlisle was looking, his eyes still bewildered, uncertain. There was a terrible, maddening strain in them, but as Spencer watched Aarn tracing the letter, like a sudden light, Carlisle saw. The strained eyes cleared, and he laughed softly, just as Anto Rayl's soft gasp echoed in the strange room.

Spencer looked up. He saw the room too, now. He saw,

and understood and he knew the geometry of this place, and quite easily he realized *why* the thing was as it was.

Aarn smiled. "I'm going to look at the cosmical constant apparatus in the *Nova,*" he announced.

Spencer went with him. Half an hour later they came back. There was the same air of strange, quiet power about him that seemed to enwrap Aarn now. In his hands he carried the telatoscope apparatus that Aarn had twisted that day back near Neptune, and as Carlisle looked at it, his mind underwent another strange transition as his eyes followed Spencer's caressing hand as it passed over one of the weird involuted projections. He understood. "Oh, yes—I think I see what you meant—the atom is *infinite!*" Then he shuddered suddenly. "Aarn, there will be no safety anywhere for anything with that in existence."

Aarn turned to him. His eyes rested on Carlisle for a moment, and in those eyes Carlisle saw something that sobered him and reassured him. "I will do it, Carlisle. First, though, we must move closer to this star. It will not bother us now, I think, for we have adjusted. Before, even when I made the cosmical constant apparatus, I did not adjust, I merely followed the mathematics, which did fit this space. This thing will be done, and then the Centaurs will be better able to live at peace with us and with themselves."

The *Sapphire* moved again, still closer to the giant dwarf. Without anti-gravity, the blue ship circled in a strange cork-screw orbit about the incredible star. And the walls twisted and changed, and all things in the ship altered. But strangely, it seemed quite understandably normal to the men within the ship.

Aarn looked again at the telatoscope apparatus, and at Carlisle. He drew a figure on a bit of paper—on and in, and through it, and Carlisle saw an atom, and knew why it combined to form water, or carbon tetrachloride or methane, and too, why, under electron bombardment it gave off X-rays, and realized it was infinite in its extent.

With Aarn he started calculations, while Spencer and Anto Rayl set up the machines, and with occasional direction from

Aarn or Carlisle, made ultra-elements, and turned them into plates and patterns.

The days passed as Spencer forged his incredible tools that would hollow out the interior of a sealed sphere of pure durium, and place in it great electrodes of ultra-beryllium insulated with ultra-sulphur. Then came the making of the apparatus itself, gigantic, filling slowly the vast space that had been left for it. And as it built up, the tons of material that had been brought along to make it were used, and more space vacated.

Finally, the new apparatus was built. Very like the strangely misshapen telatoscope Aarn had shown them that day, but on a scale gigantic and incredibly powerful. It had a stage, a great receiving stage as large as a ball-room, and higher than the highest ball-room. Big enough to house a light cruiser. And the titanic tubes and coils that powered it were warped and twisted in a way no mind could have conceived save here, where space itself was warped and twisted beyond normal conception.

As it neared completion, Aarn came in and, his calculations finished at last, looked at it. "It is safe," he said quietly, turning to Carlisle and Spencer and Anto Rayl. "Had I not thought it would be, I would not have made it. No mind not undergoing this experience can duplicate it. And, thanks to our analysis of the Blue World's screen, no man will be able to see it. This ship is screened against the telatoscope. Should they see it, they cannot possibly duplicate it, save by coming here. And only a thoroughly integrated mind can adjust here. One who is slightly warped mentally before he comes, will be hopelessly, totally unbalanced, and bring about his own destruction. It will be safe."

"But how can we test it?"

"There is no real need, but we shall do so later. I think we'd best finish, and return. What time has elapsed on Earth?"

Aarn strode to the table where the small telatoscope timepiece stood. It held on its stage, automatically, the image of a simple electric calendar clock countless septillions of miles distant, on Earth. Aarn looked—and started.

"Spencer — Carlisle — Anto Rayl—" he said sharply. "Look—"

They looked. On the stage, where there should have been the little clock, was a mass of smoking, splintered wood and metal. Hot reddish flames danced momentarily as they looked. Aarn snapped the sound switch over, and the sharp crackle of fire came through. Fire's crackle—and a slightly mechanical voice, calling excitedly, intensely.

"Aarn Munro, Aarn Munro, return. Return at once. The Centaurs are doing what you did to Teff-el; they're dropping the planetoid forts on Earth. They've dropped two thirds of the way, and our battleships can't stop them. Return." There was a slight pause, then a click, then the message started again. "Aarn Munro, Aarn Munro, return. Return—"

Aarn clicked the sound switch, and the fire blazed merrily on the little stage. As he watched it thoughtfully, a hand appeared, and added a broken bit of wood, and a bit of tar that blazed smokily for an instant, then simply smoked blackly.

"That was a clever thought. And about the only way they could get in touch with me. I—wonder." He looked thoughtfully at the near-complete apparatus and smiled to himself.

"I know a perfect test for it, Spence," he said smiling. "We'll have to rush the work a bit—but we may as well work on it. This is the only place to work, too. So let's start. There's no point in going back until we have this thing."

They started, and Aarn smiled to himself as the work progressed, and the gigantic elements of the apparatus were welded and bolted into place.

CHAPTER ELEVEN

MARL THORN, COMMANDER OF the United Forces, looked at the telatoscope stage and bit his lip. The work on the great fortifications was being rushed to the utmost, but on the other stage, twelve gigantic, roughly spherical masses of metal moved steadily, inexorably on, revolving very slowly about each other. A swarm of human battleships hung at a respectful 300,000 miles from them, showering them with every type of destruction they could muster. The greatest transpons they could draw were smashingly defeated on the transpon conductive wall about the great forts. The planetoid forts the humans had prepared were still too undeveloped to compete.

Off to one side, half a dozen battleships and a huge fleet of light and heavy cruisers were towing at a huge mass of metal nearly fifty miles in diameter. Hundreds of tremendous momentum wave tractor beams united in swinging it into position, and finally in accelerating it at the greatest possible rate.

Marl Thorn and his staff watched tensely. There was some slight movement among the Centaur forts driving slowly toward Earth. Their mass was enormous, and even the gigantic driving engines they must incorporate were insufficient to give them much acceleration. Further, the battleships clustered about them were now pushing at them with all the pressor rays they could bring to bear. The mass of metal the fleet was towing, rapidly gaining momentum, seemed a deadly threat. Perhaps—perhaps an effective blow could be staged.

The forts of the Centaurs seemed to have reached some kind of a satisfactory arrangement, and now to the bewilderment

of the humans, no further attempt was made to escape the charging mass! Swiftly it gained speed, and at last, at a distance of a quarter of a million miles, the towing fleet hastily stepped out of the way. The mass was moving a good thirty miles a second now. Even so— over two hours more remained. The ships were working now with the less effective pressor rays.

The forts simply used the tractor rays. All those on one side worked with tractors, all those on the other, with pressors. Slowly, despite the attempts at guidance by the battleships, it became evident the half-hope was no hope at all. The great mass of the planetoid passed harmlessly through the center of the formation of the forts. Then they closed back together again, in their slow, relentless orbits.

Three days passed, the staff watching grimly as the forts came nearer. Then, on the third day they came within a quarter million miles of the Moon. Earth at last was able to reply with an effective weapon. Transpons. Just sheer, brutal energy. There could be no finesse of new weapons now; each had all the powers of the other, and now, each had all the *power* of the other. The transpons of the Moon and of Earth herself leaped up, transpons vaster even than the forts could muster, and their sheer, flaming energy kept the forts at bay.

But—the forts could stand a far greater energy concentration than could Earth. Luna they could escape by going to the far side of Earth. And from there, they sent down what beams they could, from what proximity they could safely endure. Earth was immense. It took a vast amount of energy to appreciably change her temperature, but while the forts could endure a temperature change of 100 degrees, Earth could not stand more than a quarter of that without fatal results.

Slowly, slowly, Earth's temperature was driven up. There were great screens on Earth that protected her against the deadly weapons. But nothing can stop the existence of pure energy, and when there is energy, something must contain it. Earth absorbed it, absorbed tons of energy, and slowly the temperature rose. In the northern hemisphere, where it was winter, that

meant a vast thaw; in the southern, where summer prevailed, a terrific heat wave. In the tropics, where it was already hot—life became unendurable.

Five days after the forts got into position off Earth, the temperature had gone up generally eleven degrees. No great increase—but it meant agonies. It meant floods as vast glaciers melted, and the ground thawed suddenly to soft mud. It meant tornado winds over all Earth under the swift temperature rise.

And the fifth day, a messenger burst into the Staff office with amazement written all over his face. "Commander—Commander! Dr. Munro replied—he—the new message we were sending—'You are badly needed'—and suddenly his voice right beside me said: 'So I see. Keep your temper, and I'll be home. In the meantime, let's put out that silly little fire. It must be stinking up my laboratory.' And—all of sudden the fire just vanished! The fire and a piece out of the desk!"

Marl Thorn rose to his feet, and his generals with him. "Shut up and come along," he snapped as he strode down the corridor. He was half way down the passageway when another messenger popped in from outside.

"Commander," he called urgently, "Commander, Investigations Chief MacMarlin wishes to report a new development. The Centaur forts seem in difficulty, and immediate orders to retreat have been given!"

Marl Thorn came to a stop, and looked slowly at the new messenger. "So," he said. He looked at the still-excited messenger who had come from Aarn's laboratory. "I think I understand," he added. "What is this difficulty they are experiencing."

"Look in the telatoscopes—in any of the forts!" exclaimed the messenger. "I can't explain, but pieces of their internal mechanism just vanished!"

Marl Thorn returned to his office, and his operator already had the telatoscope focused on the heart of one of the forts. The power room. He jumped up as Marl Thorn entered. "Sir, something is happening—" he began.

"It is," said another voice. "It will now stop happening

till I get a bit nearer. In the meantime, your friends the enemy are retiring."

"Aarn Munro," Marl Thorn sighed with vast relief. "I thought as much."

The *Sapphire* appeared between Earth and the Moon half an hour later. Aarn Munro sat at the controls of his mighty ship, armed with such a weapon as never had been before, a weapon utterly, wholly irresistible, the weapon of weapons.

On the telatoscope stage before him, swam the control room of the nearest Centaur fort. The Commander was working, making his circuits himself, the little room crowded now with the bulky Centaurs. Evidently the full compliment of officers was on duty. Aarn watched, with delicate precision following the movements of the Centaur commander. In a final defiant gesture he sent a snapping transpon lashing out at the *Sapphire.* The automatic controls destroyed it instantly, so that it simply vanished into a black hole in space, no slightest display resulting.

Aarn's fingers made a movement, just as the Centaur Commander reached for a great control arm to increase the power on the transpon. And before his astonished eyes, the control melted slowly away, growing misty, transparent, before it finally vanished with a slight puff of inrushing air. In the *Sapphire,* back in that great space Aarn had left vacant when he set up the new apparatus, there sounded a heavy metallic thump.

Aarn smiled grimly. The Centaur reached, and passed his hand dumbly through the space where the lever had been. A stream of words ripped from his mouth, as the other officers stared. The entire control panel became misty, transparent, and vanished as they watched.

Abruptly the Commander spoke. The men rushed to new stations, and lumberingly the fort picked up speed, seeking escape. And, as it turned and ran, methodically throughout its vast bulk, there sounded the soft puff of inrushing air. With each soft explosion, outside the fort appeared some massive bit of apparatus, cosmic ray projector, anti-gravity bomber, or some major item of defensive equipment. In fifteen minutes the much-lightened fort

was gaining speed much more rapidly. It had been stripped of all armament and all defensive equipment.

All the forts were in retreat when Aarn landed the *Sapphire* on Earth. Marl Thorn and his staff joined the ship then, and as they came aboard, they met Aarn. At the sight of him, Marl Thorn stopped, and looked at him more closely. Slowly the old Magyan's eyes dropped. Before him, Aarn's grey eyes seemed to glow, and for the first time, Aarn realized that he was no longer as other men. Marl Thorn could not face those deep-set grey eyes now. Behind them lay an understanding, a scope of understanding ten thousand years beyond that of any human.

Marl Thorn spoke at last. "You have defeated the enemy, Dr. Munro. Is it permanent?"

"Yes, Commander Marl. It is permanent. They have nothing which can resist the weapon we have now, and I can see no real possibility of the Centaurs developing it.

"So far as the weapon goes, there is no need of duplicating it, and no need of letting other men know even what it is. It is too dangerous. It is a simple development of the telatoscope, but understandable only from a knowledge of fifth-dimensional physics. In effect it is a reversal of the telatoscope principle. To view, we un-cancel some of the infinitely spreading atom waves at the point where we are, to reproduce in diminished intensity the atom pattern we wish to investigate. The weapon is simply a device to *cancel* the atom wave in the place where the atom *is*. It is safest when the atom pattern is allowed to reform—that is, build a new un-cancelled position—elsewhere. But it is quite as simple to un-cancel it altogether in all the universe. In other words, release its energy. With this, I can release the energy of any atom anywhere in this universe, or bring any matter anywhere in the universe, to this point, and have it cease to be where it was.

"Do you understand its powers?"

"Vaguely," sighed Marl Thorn. "You do not wish anyone to see the new apparatus?"

Aarn smiled. "A thousand thousand have seen it already.

The air about us is alive with telatoscope finder waves. They have looked at it, no doubt, and turned hastily away. Did you try to look inside the ship?"

"Yes—and the image shied away."

"That is the only protection for the weapon. The telatoscope cannot approach within the range of that field. It is a structure somewhat similar to the cosmical constant bombs, built up from the fifth dimensional constants, making the atom pattern of the *Sapphire* non-extensive. It is practically a space in itself, with no external gravitational effects. I have lowered that shield locally to make entrance possible."

"May we see this apparatus?"

Silently Aarn led them through the ship and into the great central room. Apparatus banked the walls, and ran up, up almost out of sight in the vast column, two thousand feet above. Directly before them as they entered was a scrap heap. A pile of miscellaneous junk, iron, copper, tungsten, glass, jumbled and scrambled. It bulked fifty feet high, and covered ten thousand square feet. Junk. Junked armament from the forts.

But their eyes did not see that at first. They saw the mountain of tubes and plates and coils. Strange things. Eye-twisting things. Things that Aarn and Spencer and Anto Rayl looked on with pride and understanding; flowing, graceful—but impossible—curves. The others looked on with eyes drawn and tortured.

Marl Thorn eased his eyes on the scrap pile. "You made all that?" he asked at length.

"It is not difficult, given the proper tools, and unlimited power," replied Aarn. "Out There. Now—I believe I could duplicate it here."

Marl Thorn looked at him for a moment. "Yes," he said at length, easing his mind and his eyes once more on the somewhat-understandable scrap," I think *you* could."

CHAPTER TWELVE

AARN LOOKED DOWN TOWARD Neptune. Mighty rolling plains of frozen air, mighty glaciers of frozen carbon dioxide, and the gigantic works of the Centaurs. They were working swiftly down there, to put the planet in a position for attack on the *Sapphire*.

"They *would* still fight," nodded Aarn. The *Sapphire* moved steadily on, nearer and nearer the great forts on the planet. Abruptly, the entire world seemed to explode in lashing flame of transpons, ultras, and gigantic bombs driven at the great blue ship. Transpons, ultras, bombs—vanished without apparent action of any kind; the *Sapphire* floated unharmed.

Gradually, as the ship came nearer, tiny sparklets of soft violet light appeared as bomb or beam vanished, growing stronger as the attack became ever more concentrated. At ten thousand miles, the *Sapphire* was coated with a mesh of soft, violet sparklings, coming, fading, dying and being replaced. And all the offensive power of the war planet crashed in angry majesty on the ship—and vanished in gentle violent winkings.

"Is there any limit to what that can carry, Aarn?" asked Anto Rayl.

Aarn nodded. "There is always a limit. Even the strain space can endure is limited. The limit is enormously high; so with this. Our orifice is of fixed size, and that slight display of violet flame represents a certain degree of strain, where the orifice is being over-crowded with energy concentration."

"Energy cannot be destroyed—but where does it go?"

"Energy can be destroyed, and it can be created. That law you mentioned applies only to this space; when we bring in considerations of other spaces, particularly the inter-space, then the law is without meaning, as senseless as to say the speed of light cannot be exceeded, and not qualifying the statement with 'in this space'.

"The energy there is being destroyed, so far as this space is concerned. It becomes absolutely unavailable; out of this space. I am not fighting it, I am destroying it. That is why the new system is so infinitely superior to the old.

"I'm going to create some energy in this space. Really create it. That is what the apparatus R-438-21 is for. Watch."

Abruptly, above one of the forts appeared a black, utterly black, all absorbent sphere. A transpon beam searing upward through space toward the *Sapphire* bent, snapped about, and vanished into the black sphere. An instant before it made contact, however, white flame burst from the globe. Like a slow falling cascade of pure snow-white flame, energy poured out. It spilled out of the sphere, and licked down at the fort.

Aarn was not now limited by such considerations as engines and converters. He was not converting the energy of matter to radiation. On a higher law than any law of this space, he was creating energy, energy pure and without form. It was formless energy, neither radiation nor matter, neither kinetic nor possessed of mass. And, in obedience to the laws of space it suddenly found itself in, it sought form. It was infinite in amount, and infinite in rate, should Aarn choose. It washed down at the fort in slow streamers, a curtain of wavering, formless energy. Part assumed form as radiant light, and it became visible. Part assumed form as heat, and it was palpable. Part became matter, and assuming substance glowed with heat.

Most struck the fort, and assumed form as kinetic energy of rushing gas molecules. In the thousand-millionth of a second, the hundred-foot metal wall of the fort vanished as invisibly hot gas. Horsepower required? Horsepower had no meaning. Energy created. Not released, nor converted, but created from formless,

timeless, lawless space, and since horsepower involves time, and this energy knew no time nor law of time, it was infinite in horsepower, time and extent.

Abruptly the wavering curtain of formless energy vanished. A half-thousand mile gulf appeared raw and incandescent in the planet where for an instant the energy flowed. The curtain appeared elsewhere. Timeless, it was unpredictable. For long minutes it seemed to hang and waver without effect, bathing the fort in white, formless energy. Then abruptly both were gone.

On Neptune the Centaurs were moving again. They flooded into their ships, and as fast as they entered, the ships vanished abruptly into infinite distance—or infinite smallness.

Spencer looked at Aarn questioningly. Aarn nodded slowly. He pointed to the new apparatus that rested before him. Dials, whose leads twisted, turned, and vanished into a blank nothingness began to move, rested for an instant, then moved again. They returned to zero, and repeated the performance exactly.

Abruptly, Aarn's body seemed to shift, twist, and become indescribably *wrong*. Spencer followed the change with a strange understanding that amazed him, and, suddenly, found that the ship's cabin was changing about him, while Aarn seemed to become normal. Aarn's thoughts reached him, strangely direct without medium of sound. "You followed," said Aarn.

"So," said Spencer, looking about him. "I thought that must be it." He looked out through the walls of the ship. Fifteen feet of sapphire-blue durium lay between him and space, but as he moved—craned his neck?—suddenly he saw the durium walls lying smoothly rounded and solid—beneath him? around him?—and he looked above and beyond them. On Neptune a great convoy, loaded with struggling, swiftly crowding Centaurs lay exposed. He saw beyond those walls, saw the Centaurs and beyond them. They were mere line-drawings, yet solid, and they were as near as he wished them. As he focused his attention on one in the control room at Aarn's suggestion, he saw him move, and abruptly the Centaur ship seemed to be solid; he knew it had moved into the inter-space.

The Centaur ship became even more solidly real, and shrank again in distance. He had lost his telescopic power in regard to it. Simultaneously, he saw suddenly the Blue Universe, as through a porthole, surrounding the Centaur ship, then he could see within the ship again. He saw the Centaur commander re-set his controls, move again. The Blue Universe faded as the ship became solid. It faded suddenly into infinite distance, and he lost it.

He straightened, stretched himself—

The solid durium walls of the *Sapphire* loomed protectingly about him. He sighed deeply and looked at Aarn. Aarn sat beside him, normal, solid, real.

"I saw his settings. The instruments showed them anyway, but it is easy to understand his position now. Shall we go?"

"How about the rest of the Centaurs here on Neptune?" asked Anto Rayl, "and in Magya's Universe?"

Aarn moved, slipped aside, and became distorted. For a moment his head and shoulders seemed unsubstantial, unreal, then abruptly he was normal. "They are leaving Magya's universe now. Into the Blue Universe, and home. They are leaving Neptune as rapidly as possible. There is no need to cause them more trouble. A threat at home will cause their withdrawal more quickly than action here, under any circumstances."

Anto Rayl nodded. Abruptly, the planet below vanished in misty expansion. For an instant the strange blue light of the Blue Universe flooded in, the giant Triple Suns glowed, and the Blue Worlds appeared far off. Aarn looked at them for a long moment, longingly. Then he moved again.

Before them, Malc appeared. Dim, red, tiny. Its planets nearly as massive as itself, stretched far, far away into space. And the double planetary system of Tosk rotated as a slow dumbbell a bare million and a half miles from Malc.

Even Aarn snorted in surprise. "No wonder the astronomers missed *that!* A star so small, so utterly ordinary, and so dim."

"What are you going to do, Aarn?"

"Well—" Aarn smiled slowly, and caressed the controls of the cancelling apparatus. "Remember, I *could* take that planet

to pieces, and put it together somewhere else, given enough time. With the energy creating apparatus, remember, I am unlimited. That is above any law known to this space. We know its limits, but know they are inexpressible in terms of this space. But—" There was a beatific smile on Aarn's face. Spencer knew that signified a delightfully complete idea for proper chastisement. "—first I must get in touch with their commanders."

"How?" demanded Anto Rayl.

"The thought projectors," replied Aarn. "Do you remember my telling you about the Myryans, on the Incredible Planet, and their system of telepathy? How we used the thought projectors to separate those Siamese twin ships out by Cornal? I'm going to use them—and that other thing for which we have no language."

From the *Nova,* Aarn and Spencer brought, and set up the thought projector apparatus, and Spencer took Aarn's place at the main controls. With the light cap of the projector apparatus on his head, Aarn stood on the projection platform of the telatoscope apparatus, and, at his gesture Spencer projected his image across the five hundred million miles of space to Al-osk. A moment later Aarn made another gesture, and the image projection was dissolved.

Aarn removed the cap, and shook his head. "They aren't such a bad crowd. I got only the vast mass impression of many minds that time, of course, and two separate, conflicting mass impressions. There are two worlds, you know, and the one, the slightly larger one which is largely water surface, is just nicely populated. The smaller, however, is tremendously overpopulated. They had wars about that. Fought each other. Then from some old record, they learned of our system—and hence the attack. They need room. It's a choice of fight each other—or combine to fight someone else. Answer: obviously fight outside.

"We can fix them up for room—we've found other planetary systems already. And—I sort of think—yes, we could probably make one with the apparatus we have.

"But first—I'm going to teach them a lesson of human power, teach them that humans are labelled: TO BE LEFT ALONE: BAD MEDICINE!" said Aarn grimly. "I'm going to give them an example of chastisement and brute power that will be bred into the race for fifty generations, I'm going to give them something that will make respect for human beings a racial characteristic from now *on.*

"Now—to begin with, send my projection—" Aarn ducked his head, and weirdly his whole body altered, and the mechanism on which his hand rested writhed. Aarn vanished, but his thoughts remained, clear and picture-like. Spencer understood.

Ten minutes later, in a vast hall on Al-osk, twenty-three Centaurs stood about a table. Twenty-one were garmented in loose civilian clothes, twenty-one Centaurs with manes of iron-grey, their coats somewhat patchy, their muscles softened with fat, their lines paunchy. One stood alone at one side, young, his coat dark and glossy with health, his powerfully-muscled flanks fitted in the uniform of the Toscar Fleet. Another, sturdy, his muscles still hard and trim, his mane only slightly greyed, stood beside him.

"But Gar Thalt, what IS this weapon? How does it operate? You say things dissolve—and no more. WHY do they dissolve? Are you so witless as to be unable to suggest anything at all? Why were scientists sent with you if not for these things?" demanded Mar Porn, Chairman of the United Council.

The young Centaur replied. "What more can I say? I do not have the faintest idea of how or why things happened as they did. None of my instruments so much as flickered. Perhaps Thal Roo can answer better."

The sturdy, grey-maned scientist of the Expedition replied in turn. "Nothing whatever can I add. What it may be, I do not know, only that it is ten thousand generations ahead of us. By mere chance I had a certain gravitational experiment in process when the Black Bombs were first used—and got some clue to them, in the utter destruction of my sensitive apparatus. They were—gravitic in nature, though against gravity. They—"

The Councilor interrupted. "Anti-gravity bombs? We have had them half a generation," he said scornfully.

"Aye—and more," returned the scientist. "Therefore they were not anti-gravity. They had to do with what we of science have thought was a gravitational phenomonon but which I now know is not. In other words, they *applied* a principle I had not so much as guessed at.

"Then—that same apparatus of mine, re-made, re-designed was destroyed once more when the forts, two billion miles away, were gutted! That is not all. Gar Thalt is a good captain, but he does not know science. He has neglected the most important thing. Not more deadly—but more important so far as inferences go. The Curtain of Flame. That is what the warriors called it. It was not flame, the white, wavering curtain of destruction. I observed that, observed it carefully, and I tell you; it was energy." He paused, waiting a question. None came, and he looked at the Councillors disgustedly. "You do not even ask, what kind of energy? That is the natural question. I can say only this. It was *no form of energy!* It was not heat, nor was it radiation, or any other *form* of energy—it was formless, free energy!

"And—" he spoke so softly they could scarcely hear him—"—there is only one way I can imagine to get free, formless energy, and so impossible to divert or stop by screen or field, which must have form. That—energy—was—created—!"

"Well—can't we create energy in our engines?" demanded a fat Councillor.

The scientist collapsed. "Phaugh—!" he said. "I go—Gar Thalt, I pity you." He turned and trotted out.

And he halted as though struck a physical blow as a tremendous mental impression reached him. "Halt, scientist." He wheeled about. The Councillors were alert, rearing on their hind legs in alarm. In the center of the great flagged floor stood one of the two-legged creatures of the Other System.

Again the mental impression reached out. "Scientist, return. Perhaps you can explain to these, what I cannot. I come seeking to make a peace pact with your race."

The old Centaur scientist looked, and he saw Aarn—Aarn, squat, thick, enormously powerful. Then he looked into Aarn's broad face, so like his own, and slowly his eyes fell before the deep-set grey eyes of the human. "Arrah—it is you! Have we fought two races, then, not one? You know things—Arrah—I said they were ten thousand generations ahead of us. Look, fools, and see it."

The Space Captain looked for a moment. He looked into the infinitely keen eyes, into the powerful face of the human, and again into the eyes, and he dimly sensed that his work was done. He who had looked with awe and questioning into the Infinity through which he bored his way, and seen for moments the mystery of the Blue Universe, and gazed on the Titan of suns, Anrel, looked, and saw there an understanding, a knowledge that embraced all these, and knew their interrelations. He looked away.

The Councillors looked. He was a stubby creature, so short, and incomplete. And he was alone here. Somehow he had succeeded in getting in.

"How did he reach this place?" demanded Mar Porn. "By what right do you come?" he demanded of Aarn's image.

Slowly Aarn turned his back on the twenty-one Councillors. "I can speak with you," he said at length to the scientist. "Let us make peace; you can arrange with those, as I will arrange with my political leaders at home. Much damage has been done on my planet, and on the others of our two systems. We can ask no indemnity of you, since there is nothing we cannot obtain more readily by our own powers. There is nothing you can do for us.

"But every ship of war, every item of war, every fort and every offensive and defensive weapon in this system must be destroyed. You can build more, to a certain extent, but they shall be limited only to a policing force. We have—means for discovering every crime, every wrong action or thought. A large police force will be unnecessary. And there will be no war.

"That is simply because such is best for your people, lest they attempt to attack humans once more.

"In consideration of your actual need for room, we will do

one of three things; find or create a new planetary system for you, or increase the size and power of your present sun till it makes more of the planets of this system habitable. I tell you: we can do these things, the first within a week, the second within ten days—and the last shall be done within ten hours if your Councillors do not agree within that time to our terms."

Very slowly, Aarn expanded, and became tenuous, transparent, till he was a mist that reached the thirty-foot ceiling. Then he was gone.

The old scientist turned to his Councillors. "You got his message?"

"Preposterous!" gasped Mar Porn. "Utterly impossible! Are we fools to strip our worlds of their weapons? That we should believe such nonsense—'find or *create* a new planetary system—increase the size and power of your present sun—'! The mightiest engine ever built could not so much as move a planet a foot—let alone create one!"

Thal Roo looked at them long under his greying lashes. Finally he spoke. "He said he could do those things. I will not argue with you. Only I looked into his eyes, and I know he believed what he said—and because he did not speak with his tongue, but with his mind, and because I was very attentive, I understood more. He does not expect you to accept those terms, he has no idea that you will, for he feels that the Toscars need chastisement, and that some reprisal is due for the damage wrought on his worlds. He feels you will not believe him, nor accept his more than fair terms, considering his power, and so, when the ten hours are up, Tosk shall be chastised.

"He is right, of course. You *are* fools. I shall be sternly clapped into prison for this, but it matters little for I shall be free within twelve hours. He gutted the forts from a distance of thousands of millions of miles. He approached within a few thousands of the First Base, while all our powers hurled against him, powers enough to volitalize a minor planet, served only to make faint sparklings on his ship. Then, idiots, do you not see he could, from where his ship undoubtedly is now, simply wrench

out those things he tells us to discard without the slightest difficulty?"

Thal Roo was quite right. Within half an hour he leaned his tired body against the locked bars of his prison, and looked meditatively at the large, to him, white disc of the sun Malc, only a million and a half miles distant.

Nine hours and thirty minutes later, Aarn reappeared in the Council room above. Twenty one Councillors sat about, or stood about the table. They started at his sudden appearance. Aarn regarded them steadily.

"You do not believe, do you? Your scientist was right. He has a mind a bit keener than I credited him with. It is as well. You were doubly warned. You refuse, do you not?"

Proudly Mar Porn drew himself up. "Learn a warrior's lesson, creature with but half a body. A Toscar is not defeated before he begins to fight. You have but now discovered our system; our ships are but temporarily driven from your system, and you want us to surrender our weapons, our worlds!"

Aarn's face broke in a slow smile. "Watch your sun," he said. Slowly he faded away.

The *Sapphire* had rested undisturbed. Battleships had sighted her, but had left her strictly alone. A dozen scout ships, gnats too small to worry about, kept her under observation, while the planetary defenses prepared to repulse her.

Aarn turned to Spencer with a grim smile. "Now for the lesson no Toscar shall ever forget. They will not know how I am doing it."

There was no sound of transpons aboard this ship. Energy was created, formless, infinite in amount and rate where needed. A field was developing, though, an enormous field of three branches. A very small branch ended on the telatoscope stage of the *Sapphire*. But another, the primary, reached across an incomprehensible gulf of infinite space, reached out, found, and held a star, the mightiest, blazing star of all this universe, so far as is known, the incredible star S Doradus. With a surface temperature of some 75,000 degrees centigrade, and enormous size, it gave off

something in the near neighborhood of 5,000,000,000 times the light and heat that Malc gave, and—it gave it almost entirely in the ultra-violet band, far above the range of Centaur vision.

The final branch, of course, centered in Malc.

Aarn began building up his field. Slowly, the dull red color of Malc changed, very slowly, so that it became a slightly brighter red. And at the same time, Aarn established an unusually large free-energy field near the star, on the side toward the Tosk system. The wavering curtain of white flame was visible easily to the naked eye at ten million miles; a huge curtain of energy at one and a half. Malc, for all its small size as a star, was infinitely beyond the power of this small energy flame to heat appreciably. But—Malc was getting hotter. Actually, Aarn was gradually establishing about Malc, an image of S Doradus! An image 75,000 miles across! An image of the star that began to radiate more and more. More and more the radiation drowned the faint light of little Malc, till the light that fell on Tosk was not red, but white, then gradually it became blue, and the gentle warming rays of their sun became horrible blistering furnace blasts.

In a prison cell, an old Centaur looked out, and his face was pale, and his eyes wide in awe as he saw dull little Malc change from a weak dim thing to a terrifically flaming, raging furnace in the space of two hours. Prominences, things Malc had never been known to display, began to leap out, licking tongues of flame so far in the violet that the Centaur could not well perceive them, and his eyes throbbed with the pain as he tried to look at the incandescent monster.

He was trembling when he returned to a dark corner of his cell. He was afraid for his world. A patch of friendly sunlight had crept in through his barred window, but now—it was a poisonous thing, a horrible, luridly violet thing. The dark corner of his cell became light, light with the waxing sun. The diffused light began to pain his eyes, and his skin began to burn from the heat, and outside he heard a rising moan of terror.

And a deeper moan. A low, growling rumble, and a shrill keening whistle, and he shuddered again. The wind was rising.

It swirled hot and dry in through the open window, and ruffled his mane. A fitful gust. The weird sunlight was still growing more intense, and burning heat was radiating now from the spot where the sunlight struck. There was a soft, sharp clack, and a sliver of the stone spurted up. The old scientist trotted over, and stuck his hand into the direct light. Instantly he drew it back, and shook it. It felt as though a great burning glass had been focussed on it!

The trotting feet had quieted now. There were no more. Once in a while he heard a wild beat of galloping feet rushing by, the gallop to break with a harsh cry, and a staggering step. Then the thud of a fall—a scream of pain as the burning ground pressed against flesh, a wild scurry—then a slowly dwindling cry.

And the wind began to moan. It rose, and the moan became a howl. A cloud passed abruptly over the burning patch of deadly sunlight, and the Centaur felt his skin prickling with what he knew must be radiation burn. Dimly, far off he could hear a mighty, deep-throated roar of transpon beams, and the strange soft hiss of great magnetic and gravity bombs sweeping up, and he laughed. He wondered what they were aiming at. The growing sun? The wavering curtain of formless energy that would drink them in and add them to the store it was feeding the horribly swollen sun?

The cloud was gone in an instant, and the scientist saw that the shape of the shadows on the floor was changing. He thrust a slim metal eating tool into the bar of light, and from the size of the shadow, readily realized the sun had grown larger, as well as hotter.

And the wind continued howling. It shrieked about the window ledge, dust-laden, a furnace blast that stifled him as he flooded water into a bowl, wet a towel, and pressed it to his nose.

Suddenly there was a mighty hissing, the sky darkened to a bearable intensity, and torrents of rain swept to the ground to shrill into steam and rebound instantly. For ten minutes this kept up, and the rising temperature dropped, only to rise again with an unbearable mugginess. His flanks heaved.

"By all the Gods—if he does not relieve us soon, we will not be able to agree to his terms. And can he drain that swollen sun as quickly as he inflated it? Oh, Gods, what is there for us who understand him to do?" the old Centaur moaned.

"Much," said the familiar mental voice. The Centaur wheeled. Aarn stood before him, squat, powerful. "The sun will soon be drained of its surplus heat. The planets will not cool quickly, however, not for days, for they have absorbed vast energy. You will be released at once. Go out, and see what you can do directly with the people. The third planet out from your planet-system will be made sufficient of a sun to remind you that I am still about. In two days time I will return. Till then, I will be very busy removing the apparatus of the forts."

Aarn vanished, and with him, the great barred door, and the solid stone of the outer wall as well, as an afterthought.

As he stood, hestitant, far away he heard the thunderous voice of a great transpon projector snuff out in a little tinkling squeal, to be followed by a terrific roar and crash of dropped metal. Aarn had raised it a quarter of a mile in the air, and dropped it back—rather had destroyed it, and re-created it a quarter mile up, and released it.

Rapidly, the old scientist saw, the unbearable light was dying from the sky. He could not tell much, though, for there were vast scudding clouds, and a terrific rain that slanted down in the wind, at an angle less than twenty degrees. The wind shrieked and snarled, gaining power.

But definitely, the light was dying.

He stepped out, the wind-driven rain beat at him, lashing him cruelly, as it lashed all his world and all his people, bowed before the keening blasts.

CHAPTER THIRTEEN

MALC GLOWED WITH A REDDISH white light, intensely blue to Toscar eyes, intensely hot to Toscars on their oven-heated planet. In their night skies, a new sun shone, the third planet, incandescent blue to Aarn, almost invisibly blue to Toscars. Aarn had poured his White Flame against it for—what interval can be used to express it? Timeless by nature, infinite, beyond all law of time and limitation it had done its work. The planet glowed.

"You've completely withdrawn the image but Malc is still over-hot," said Carlisle slowly.

"Not unbearably so. I could not withdraw the heat the sun absorbed from the image. Nor that which it absorbed from the not-altogether-bluffing White Flame. It will not bother them, and in six months probably will be diminishing. The red dwarf sun is peculiarly stable, as we know.

"I have another problem. I promised them planets. Their worlds are stripped of arms. They would not dare to think again of attacking man. For weeks yet, their worlds will be lashed by storms such as Earth never knew. For the side that was in daylight when I projected the image, is far too hot, and seeks equilibrium with the night side.

"I think I will create planets." Aarn's eyes glowed with intense thought, and slowly a smile crossed his lips. "It will be helpful. They will not understand."

The telatoscope screen blurred, and darting points shifted, steadied, and shone bright and hard under Aarn's manipulation.

Stars. All the stars in this region of space. And Malc shown dimly reddish yellow in the center of the stage. Perhaps fifteen light-years distant another star shone dimly reddish, no dwarf though, a super-giant, a star of the Antares class, so distant from Earth it was unnamed, unrecorded, save on photographic plates as a barely visible spot.

It centered suddenly, and the *Sapphire* moved, darted toward it, and hung near it. A dozen instruments moved under Aarn's manipulations, steadied, gave their readings. For half an hour Aarn studied the star, probed its deep interior, read the moment of momentum of its system, and knew it possessed no planets, only a small family of wandering, captured comets, quantities of meteoric dust wandering in aimless orbits about it, occasionally striking, deflecting, falling to it.

"A sterile system," said Aarn. "We'll try to bring it life. I'd like to—but it will be hard to eliminate the people. How—the life forces—but that includes plants. Sea life. Microscopic animals—ah, plants—And with the telepathy selection—"

Spencer looked at Aarn in puzzled silence. Then slowly he grasped Aarn's gigantic plan, and gasped. "Bring the old Centaur scientist!" he suggested suddenly. Aarn nodded in confirmation. "Good idea. I will."

The ship pulsed suddenly to a surge of power, the telatoscope screen darted swiftly misty, then steadied as Aarn concentrated his attention on his telepathy devices. A conference room appeared, a score of frightened, nervous councillors, a half-score of scientists and old Thal Roo.

"Will you use sense?" asked the old scientist softly. "Must more be done to convince you you have no appreciation of him? You are panicky. There is no sense in attempting to destroy him; it would be suicidal to attempt it, and he means us no great harm, I believe."

"The Sun—the Sun—even now the air stifles us. He can do it again! What protection have we?"

"None, and that's the point!" snapped Thal Roo. "So wait. He will return with further instructions."

"Further destructions," moaned the Councillor.

"Fool, coward, come free of your panic, use what reason you have left. He is not going to destroy us. Had he wanted, he would have heated this planet—not the third. He will return and speak again."

"I have returned," said Aarn. The other scientists started, and whirled to face his image. They looked at Aarn, at his eyes, and yielded back two steps as he approached slowly. "I will create your planets. Five of you I will bring with me that you may watch. I will create your planets near a giant red sun, one which has a color like this Malc of yours, but one infinitely greater. Yet it will appear the same.

"Which of you is of astronomy? Step toward me." Two of the group of scientists stepped forward. "Which of you is of astrophysics?" Both stood where they were.

"Well enough. Which of you is of the physics of weapons, and energy sources?" Thal Roo and another stepped forward. "Well enough," said Aarn, and turned to the leader of the councillors. "You too, will come. Now look." In the chamber of the Council appeared a telatoscope image of the space nearby. Malc showed in the center, the new sun off to one side. "See—that is Malc. Do you know this sun?"

"Aragantor!" gasped the astronomers together.

"That is your new sun. Remember it. Let the five chosen gather together here in the center of the room."

Thal Roo stepped eagerly forward. The astronomers glanced at the wonderful image of space, the mighty stars shining points floating in the air, and, eyes fixed on it, hesitantly stepped toward Thal Roo. The remaining physicist of weapons looked out of the window toward a torn mound of earth and gleaming, crumpled metal, ruined weapons, and stepped eagerly forward.

The Councillor was galloping toward the door. A hoarse cry of fear gurgled from his throat. Thal Roo looked after him. "Take us, Man of Understanding; he would not see for his fear."

Softly Aarn laughed, as the four scientists turned from looking at him who fled, to Aarn. They looked at Aarn, and for

an infinitesimal instant Aarn's figure waved, writhed, and for that infinitesimal instant there was a terrific, excruciating stab of agony as every atom within them disrupted, then Aarn was steady before them, and the agony was gone.

The council room was gone. Metal walls loomed, metal of a color that strained their eyes, and yet looked gray, with a hint of a color they could not understand. A star glimmered beyond, a small reddish sun. A disc of comfortable "white" color.

"Aragantor!" gasped the astronomers together.

"Is this distance right for your planets?" asked Aarn.

"Aragantor has the same surface temperature Malc has—had is better. When the apparent disc of Aragantor is the same as the apparent disc of Malc the distance will be right. We should be nearer," said the astronomer. "But I have no instruments."

"What would you have? What small instrument? Think of it," commanded Aarn.

Then Aarn moved very rapidly, and set up many circuits together on his great control board, and interconnected them, and one was a telepathy machine, and one was a telatoscope, and one was a circuit of the White Flame.

Something indistinct wavered in the air, an instrument; then suddenly it exploded in sparkling, coruscating, soundless flame as the astronomer cried out in startled surprise. "Think, and think clearly," said Aarn disgustedly. "As you see part form, correct the thought, and the part will correct itself."

The astronomer thought again, and a thing of metal and crystal and lenses and angles formed, and writhed and flowed, then suddenly collapsed again into nothingness. "Now what ails you?" asked Aarn.

"The lens—the index of refraction," wailed the astronomer.

"Enough," said Aarn. "I know what you need, now." He made a change in his setting, the instrument appeared again, steadied, held. It was sharp, precise in line. A scale on it appeared, marked with fine, sharp lines, then faded. "Picture your units on the scale," said Aarn. The astronomer did so. Then—

there was a soft puff of heat and clear light, white, like a wavering, flowing crystal. The instrument in the air dropped suddenly, and Aarn turned swiftly and caught it. He passed it to the astronomer. "Can you use that?"

The Centaur turned it over and over in his hands, and his face was strangely blank as he examined it. "Arragh—can I use it?" He looked at the lenses, and murmured softly, "They are mathematical. The thing is not machined, it was dreamed, and the dreams were mathematical formulae."

He raised the little hand instrument to his eyes carefully, looked at the red disc, and smiled softly. "Some fifteen seconds more, we must have."

In ten minutes, the *Sapphire* was in position.

"I have not the time nor inclination to make your planets perfect. As you have built, so shall they be, neither better nor worse. Perhaps it is best. There shall be the scars on them that shall remind you that your race attacked mine—and it is best that it happen no more.

"Look." The astronomers, the scientists gasped softly. Sorosk and Al-osk floated out there, beyond, perfect in every detail as the telatoscope showed them. And—they were full sized images.

"So," said Aarn quietly. "They are your planets. There are the buildings, the habitations, all as they are on your own planets, save that there are no people in them. I shall return you, and let forces be sent at once, lest uncontrolled machines damage themselves. I shall hold them in stasis until your fleets can reach and control them. I will wait till they near the planets. Then I return to my own world. I shall be back . . . Take the instrument with you."

Again the agony shot through the Centaurs, and abruptly they were in the council hall. White faced they sank to the floor.

Thal Roo stirred first. "He has made the planets—these planets—with all the machines, all the structures, all the things we know. On that strange planet I can find my own house, my own room, my own clothes. Only the people he has not dupli-

cated. How—I do not know. Go—send the fleet—the machines must be controlled. He waits."

Aarn cut off the image as Thal Roo looked at the wonderfully perfect instrument in his hand.

On the *Sapphire,* Aarn straightened. "To work."

"But those—are telatoscope images," said Anto Rayl in puzzlement.

"*Now* they are." Aarn seated himself again, and looked out. Sor-osk and Al-osk floated motionless outside. "They are telatoscope images, but every thing in them that has thought activity is missing. So there are no Centaurs. And a telatoscope image is a sort of basic pattern of an atom—sort of a skeletal framework, unfilled, incomplete." Aarn smiled, and rested his hand on a control. "It is limitless, theoretically. I think I shall test it."

He advanced the control abruptly to the end of its run. The universe twisted suddenly, violently, as a wave of nausea struck them and rolled on. The mighty star started under the impact a few minutes later, and at the same instant the whole of space exploded into white flame. White, limpid, flowing flame.

Aarn cut the controls, and his panel went dead. Sor-osk and Al-osk floated just outside the *Sapphire,* two giant worlds.

"All space must have felt that—unthinkable quintillions of tons of matter—mass—energy really, crystallizing from the formless White Flame on the skeleton structure of those atoms. Mass that never existed before. But there they are now. Complete—ready for habitation. And the fleet is coming. We will go."

The *Sapphire* moved, shifted hazily for a moment, and vanished from the sight of the swiftly nearing Centaur fleet.

And the men in the *Sapphire* looked out at the Blue Universe, and the giant triple suns. "We've got to go home now," said Aarn softly. "But someday soon—"

The Blue World faded from the telatoscope stage, and Earth loomed large on it instead.

—THE END—